Marine Engineering
And Shipping Age

Vol. XXIX **NOVEMBER, 1924** **No. 11**

Page

Editorial Comment 633
The growth of motorship building. Investment in ships. Care in the use of fuel oil. The William Froude National Tank. The laid-up ships. The Diesel bids.
Marine Engineering and Shipping Age, November, 1924.

Port Differential Investigation Concluded 637
By HAROLD F. LANE.
Monthly review of Shipping Board activities. Consolidation plan completed. More grain ships authorized.
Marine Engineering and Shipping Age, November, 1924.

Lubricating Tail Shafts with Oil 638
By W. G. ESMOND.
Description of McNab-Vickers tube appliance which provides means for lubricating propeller tail shaft with oil. 1 illustration.
Marine Engineering and Shipping Age, November, 1924.

Safeguarding the Lives of Lake Seamen 640
By GEORGE A. MARR.
Lake Ship Safety Committees reduce fatalities nearly 50 percent in six years of operation.
Marine Engineering and Shipping Age, November, 1924.

Engineer's License, Training for an 641
By DAVID GAEHR.
Helpful suggestions regarding the habit of study and selection of books for ambitious beginners in the engine room.
Marine Engineering and Shipping Age, November, 1924.

Passenger Steamship Greater Detroit 643
Great Lakes side wheel steamer recently built by American Ship Building Company for Detroit & Cleveland Navigation Company. 17 illustrations.
Marine Engineering and Shipping Age, November, 1924.

Motorships, Mixed Cargo and Passenger 649
By OUR SPECIAL LONDON CORRESPONDENT.
The *Centaur* built for the eastern trade and the *City of San Francisco* for Pacific coast service. 3 illustrations.
Marine Engineering and Shipping Age, November, 1924.

Passenger Steamship Aurania 653
New 14,000-ton Cunard cabin and third class liner recently placed in New York service. 7 illustrations.
Marine Engineering and Shipping Age, November, 1924.

Laid-Up Fleet, Care of the 654
By JAMES SWAN.
Program adopted by Shipping Board reduces cost of maintaining laid-up fleet and improves its condition. 3 illustrations.
Marine Engineering and Shipping Age, November, 1924.

Towing, Elastic 657
By SPENCER MILLER.
Investigation of deep sea towing. Details of new type of automatic tension towing engine. 6 illustrations.
Marine Engineering and Shipping Age, November, 1924.

Page

Corrosion Can Be Reduced, How 663
By C. A. MCALLISTER.
Bottom plates of the *Leviathan,* containing 1.67 percent of copper, show surprising resistance to corrosion. When the increased cost of copper-bearing metals is justified.
Marine Engineering and Shipping Age, November, 1924.

Sewage Ejection 664
By W. E. SPOFFORD.
Automatic compressed air sump tank sewage ejection system successfully installed on passenger steamers. 1 illustration.
Marine Engineering and Shipping Age, November, 1924.

Diesel Engines, Cam Profiles and Fuel Injection on 665
By MAJOR JOHNSTONE-TAYLOR.
Results of experiments made by British Admiralty and reported to the Institution of Naval Architects by Commander Beaman. 4 illustrations.
Marine Engineering and Shipping Age, November, 1924.

Furnace Failure, True Cost of 666
By I. S. PIETERS.
Factors entering into the cost of marine furnace repairs. Brick and monolithic furnace linings compared. 2 illustrations.
Marine Engineering and Shipping Age, November, 1924.

Passenger Steamship Statendam Launched 667
Marine Engineering and Shipping Age, November, 1924.

Flue Gas Tester, Portable 668
Marine Engineering and Shipping Age, November, 1924.

Motor Tankers to Have Double Acting Engines ... 668
By OUR SPECIAL LONDON CORRESPONDENT.
Six motor tank ships recently ordered by Anglo-Saxon Petroleum Company to be fitted with double acting Diesel engines.
Marine Engineering and Shipping Age, November, 1924.

Diesel Engineering, Practical—V 669
By LOUIS R. FORD.
Maneuvering. Routine under way. Engine room stores. Purchasing fuel and lubricating oils. Precautions in handling fuel oil. 3 illustrations.
Marine Engineering and Shipping Age, November, 1924.

Turbines, Operating and Maintaining Reaction 673
By O. M. GORDON.
Practical suggestions on the proper methods of operating, adjusting and maintaining both turbine and reduction gear.
Marine Engineering and Shipping Age, November, 1924.

Water Rates of Marine Auxiliaries—V 676
By E. A. STEVENS, JR., and H. E. BRELSFORD.
Steam consumption of auxiliaries in port. Cargo handling and bunkering. Problems showing calculated and actual results.
Marine Engineering and Shipping Age, November, 1924.

Questions and Answers 682

New Books 684

Personal 684

Shipping and Shipbuilding News 686

Simmons-Boardman Publishing Company
30 Church Street, New York, N. Y.

EDWARD A. SIMMONS, President — HENRY LEE, Vice-President and Treasurer — C. R. MILLS, Vice-President
L. B. SHERMAN, Vice-President — SAMUEL O. DUNN, Vice-President — ROY V. WRIGHT, Secretary
F. H. THOMPSON, Vice-President — GEORGE SLATE, Business Manager

CHICAGO: 608 South Dearborn St. — BOSTON: 294 Washington St. — LONDON, England: 34 Victoria St. Westminster, S. W. 1.
CLEVELAND: 6007 Euclid Avenue — WASHINGTON: 17th and H Sts., N. W.
NEW ORLEANS: 927 Canal St. — SAN FRANCISCO: 74 New Montgomery St. — Cable address: Urasigmec, London.

Subscription price, United States, Mexico and Canada, $3; foreign, $4. Foreign subscriptions may be sent through our London Office, 34 Victoria Street, S. W. 1.

Generated on 2024-09-12 12:02 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Marine Engineering
and Shipping Age

Volume XXIX **November, 1924** **Number 11**

Published Monthly by
SIMMONS-BOARDMAN PUBLISHING COMPANY
30 Church Street, New York
JAMES SWAN, H. H. BROWN } Editors
L. S. BLODGETT, Associate Editor W. Z. GARDNER, News Editor

Contributing Editors

Rear Admiral C. W. Dyson, U. S. N. William T. Donnelly
Commander S. M. Robinson, U. S. N. H. McL. Harding
William Gatewood James L. Bates
Captain C. A. McAllister, U.S.C.G. (Retired)

Subscription price, United States, Mexico and Canada, $3; foreign, $4. Single copy 35 cents. Foreign subscriptions may be sent through our London office, 34 Victoria Street, S. W. 1.

MARINE ENGINEERING AND SHIPPING AGE is a member of the Associated Business Papers, Inc. (A. B. P.), and the Audit Bureau of Circulation (A. B. C.)

Request for change of address should reach us two weeks before the date of the issue with which it is to go into effect. It is difficult, and often impossible, to supply back numbers to replace those undelivered through failure to send advance notice. In sending us change of address, please be sure to send us your old address as well as the new one.

The Growth of Motorship Building

ONE of the most interesting items of statistical information contained in the last quarterly report of Lloyd's Register of Shipping is the record of the greatly increased number of motorships under construction.

The report states that "Of the entire world's shipbuilding, 36.4 percent now (September 30) consists of motor vessels, as compared with 30.9 percent on June 30." This increase, amounting, as it does, to over 125,000 gross tons, is most notable, particularly as the report goes on to say that "the decrease in the construction of other vessels than motorships is marked, amounting to a decline of nearly 170,000 gross tons during the quarter."

While the trend towards the adoption of internal combustion machinery is not so marked in Great Britain as in some of the smaller maritime countries, the motorships under construction amounted to 26.4 percent of the British total; a fact that indicates pretty clearly that a very considerable proportion of British shipowners have definitely decided in favor of the motorship, as against the steamer.

Undoubtedly, keen competition by foreign ships, an increasingly large number of which have internal combustion engines, has played a large part in bringing the British shipowners to this decision. To retain their hold on many lines of trade in which their foreign competitors are particularly active, operating costs must be cut to the lowest possible figure even at the expense of increased capital charges which might largely offset the gain in fuel economy.

It is quite likely that the greater unit cost of Diesel machinery is already being reduced by the increased production, as well as by the adoption of double acting engines. We have no reliable recent figures on the cost of British motorships. The difference in cost between them and steamers is still very considerable but we believe that for long voyages at moderate power there is little question as to the superior overall economy of the motorship, provided suitable oil can be obtained, at a reasonable price. At any rate, a steadily increasing body of shipowners appear ready to take the chance insofar as the supply and price of oil is concerned.

In this country conditions are different, at least so far as the private owner is concerned. He is practically confined to protected trades and until conditions improve is not likely to embark on any extensive construction program, either of steam or motor vessels. The Fleet Corporation, on the other hand, is meeting direct foreign competition and, if it is to continue to hold its losses at their present figure, to say nothing of decreasing them, it must have motorships, in increasing numbers.

This contingency, for the immediate future, at least, will be provided for by the Dieselization of laid-up vessels, about to be undertaken. As a result of this, the government should have at its command some serviceable and highly efficient vessels obtained at a relatively moderate cost. Judging from Lloyd's statistics, it cannot get them into service too soon.

Until the complete contracts for the conversion of the Fleet Corporation vessels have been awarded, it is impossible to say just what the cost of the converted ships is going to be. Judging from the bids so far received it would appear that it will be not far from the cost of a new motorship, built in Great Britain. So far as initial conditions are concerned, the advantage will lie with the foreign vessel, but the presence of a practically inexhaustible supply of relatively cheap oil in this country would appear to compensate for this, to some extent.

The conversion of the government vessels has given rise to most extended and animated discussion in shipping circles. One prominent shipowner has expressed the opinion that the ships cannot be converted at a cost which will enable them to compete with steamers, purchased from the Shipping Board at from $25 to $30 a ton. This may be true, as regards short voyages, but we are inclined to the belief that when the conversion is completed, the resulting motorships will be found able to get and hold the trade, as against the Board's

Generated on 2024-09-12 12:05 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

most economical steamers, and that the work of converting additional vessels will be proceeded with, on an extended scale.

Investment in Ships

NOTWITHSTANDING the generally unsatisfactory condition of the shipping business, indications are not wanting of proposals to institute new lines or construct additional vessels for lines already established immediately the necessary financial backing can be found.

Potentially there is a demand for new vessels in the coast trade; for normal expansion when commercial conditions become more stable as well as for the replacement of old vessels of which there are still many in the various coastwise services.

For intercoastal service more vessels are available than at present can be profitably used but it seems probable that new ships of special types will eventually be required for this trade and that the return of normal prosperity and production, to the country as a whole, will bring about the employment of a large number of vessels to handle both passenger and cargo traffic between its east and west coasts.

Even admitting, however, the probability of an improvement in the shipping business and a consequent demand for new vessels, the hesitation of bankers and investors to embark in maritime enterprises can hardly be considered surprising.

To begin with, the mass of the people know little of ships. Maritime business, as a whole, appears to them of a more hazardous nature than the various enterprises on shore with which they are more or less familiar and, furthermore, the practical certainty of financial loss involved in the operation of American vessels in foreign trade, which has been put forward so prominently in the various arguments for relief legislation, seems to be considered, by many, to apply to their employment in any trade. There is, also, the feeling that ships are not as essential to the welfare of the country as are the railroads and other great industrial and commercial enterprises which since the civil war, have given employment to its available capital.

A general knowledge of shipping and its relations to national affairs can come only as a result of education, as was the case with the demand for an efficient navy in the eighties, at best a rather slow although a sure process. We have the feeling that the demand for ships will eventually come as the result of economic pressure, as the resources of the country develop and expand, but this, again, takes time. What we are concerned with is the present hesitancy of capital to interest itself in ships.

Uncertainty is no doubt the underlying cause. To quote the recent report of the Marine Securities Committee of the Investment Bankers Association: "American merchant marine problems are in a period of transition which makes any definite statement regarding the future practically impossible. The opinions of experts and men in close touch with shipping matters differ as widely as the opinions of the average individual and conclusions reached are subject to frequent change."

Although some of the confusion and indecision which existed a year or so ago has been cleared away, the uncertainty which still surrounds the private operation of American ships is difficult to fathom. The future is still pretty much obscured and the average owner can, with safety, attempt to keep in operation only such tonnage as he has and hold in abeyance any plans for improvements or expansion which in better times would, without question, be undertaken.

The Shipping Board, as it still owns over one-half of all American seagoing vessels, is the dominant factor in the situation. The act by which it was created requires that it dispose of its vessels to private owners at the earliest possible moment, but the very fact of its existence, as an active participant in seaborne trade, makes the originally intended consummation of its activities well nigh impossible. Unless or until there is such an improvement in world trade or change in our laws as to warrant the entry of privately owned American vessels into overseas trade, government operation is likely to continue—at any rate, it may be counted on as a certainty for the immediate future.

The Board is wisely limiting its activities so as to interfere, to the least possible extent, with private enterprise, but until it has evolved a more definite policy and the public is assured of active and whole hearted cooperation among its members, it will continue in the nature of a menace to private enterprise and cause the diversion of capital which might otherwise safely be invested in American ships.

Care in the Use of Fuel Oil

IN his recent address before the Propeller Club, Mr. J. L. Luckenbach drew attention to the carelessness often attending the use of fuel oil with its resultant pollution of harbor waters and gave a timely warning to the effect that, unless the operating personnel aboard ship mended their ways, drastic legislation, to the very material embarrassment of the shipowner and operator, might be expected.

A certain small amount of leakage and waste seems to be characteristic of nearly all vessels carrying oil, either as cargo or fuel. Just how far this may be prevented in service, we are not prepared to say. The shipbuilder usually has little experience with loaded oil tank steamers, at least when they are loaded with oil. It is quite true that the fact that they show no leakage when filled with water is by no means a guarantee of absolute oil tightness, but in a well-built vessel, of adequate strength to resist straining in a seaway and a consequent starting of calking, the shell leakage certainly should not be a serious matter.

It does not seem likely that the oil which may be legitimately lost through the shell of a vessel or in any other similar manner is sufficient in quantity to be considered a menace by harbor authorities. In any event, it certainly can be kept within reason by careful observation when afloat and thorough inspection of the shell plating when in dry dock. It is in the handling of the oil into and out of the ship, and in the clearing of tanks, bunkers and bilges that the trouble mainly arises.

A certain amount of leakage from piping and connections is practically unavoidable and eventually finds its way into the bilges. Tanks can never be pumped absolutely dry, and, if they are used alternately for oil and water ballast, a

Generated on 2024-09-12 12:16 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

certain amount of oil is present in the ballast water, when the latter is pumped out.

Ordinarily, there seems to be no good reason why bilges should not be cleared at sea, well away from shore. Certainly with the exercise of the most ordinary forethought and care the necessity of clearing them in port should rarely occur. The clearing of ballast tanks which have previously carried oil is a much more difficult problem. No arrangement of suctions can ever take out *all* the contents of a tank. A small residue remains under all circumstances, to float on the ballast water, or becoming emulsified to form a residue which, without special provision being taken, cannot be pumped and remains to constantly pollute the water discharged from the tank.

In good weather, practically all ballast water can be discharged before entering port but in bad weather it must be retained until the vessel reaches sheltered waters. Under the latter circumstances the discharge of oil into the harbor water can be prevented only by separating it out on board or by discharge into tank barges from which it can afterwards be reclaimed. It is undoubtedly through negligence or carelessness in carrying out these operations that the pollution occurs which is giving rise to the steadily increasing complaints of harbor authorities and the various communities bordering upon our rivers and harbors.

A certain amount of water may be purified and the oil contained in it salvaged, on board ship, by such methods as those described by Mr. Hecking, in our July, 1924, issue, or by mechanical separators or filters. From the viewpoint of economical operation alone, it will very likely be found advisable, eventually, to adopt some such apparatus or methods on all oil burning steamers, but it seems doubtful if they can be successfully applied to the purification of large amounts of ballast water in the short time usually available for discharging it. In the latter case, barges must be employed.

We feel certain that, with a little care and foresight, all waste oil, often a sufficient amount to be well worth saving, can be recovered and the discharged water satisfactorily purified by separation on board or by receiving all discharge in barges or shore tanks.

If this is not done, we fear that the constantly increasing volume of complaint will result in drastic and, very likely, unintelligent legislation, forcing on the shipowner the use of expensive apparatus which, in the end, may be found quite unsuitable for practical use.

The William Froude National Tank

THE value of model tests in connection with the solution of the various problems presented in the powering of ships has long been recognized. Several government model testing tanks have been in operation for many years, but with the exception of the Denny tank, at Dumbarton, Scotland, there has been none specially devoted to merchant work, until comparatively recent years.

The initial expenses involved in the construction of a model tank are great, and the cost of maintaining the highly trained staff necessary to conduct experiments having results of really practical value is entirely beyond the means of the average shipyard.

The various government tanks have been made more or less available for private work, but they are primarily intended for the investigation of problems arising in the design of naval vessels and by far the larger part of the work of their staffs is necessarily devoted to this work.

In order to make model testing immediately available to the great mass of British shipbuilders and naval architects, as well as to carry on extended investigations of subjects having particular bearing upon the design and operation of merchant vessels, the William Froude National Tank was established in England in 1908, as an adjunct to the National Physical Laboratory.

This institution is under the supervision of an Advisory Committee, comprised of some of the leading naval architects and shipowners of the United Kingdom. The immediate work of testing and the many related activities in various lines of investigation is in the hands of Mr. G. S. Baker, whose name has well become a household word in the field of naval architecture.

The report of the Advisory Committee for 1923 gives, in outline, an idea of the work which has already been accomplished by the National Tank, its present capabilities in the way of meeting the demands of private investigations and the broad line of work and study which has been laid out for the future. The following standard data can now be obtained from experiments in the Tank:

1. Resistance of any ship-shaped form of any type or speed, and the possibility of improving the form by alteration of shape, etc.
2. Effect of rough water on resistance, pitching and general seaworthiness of any given form.
3. The propulsion efficiency of twin and single screw ships.
4. The resistance and other features of motorboats, hydroplanes and flying boat aeroplanes.
5. Measurement of wave profiles along the side of the ship at any speed.
6. Forces upon ship rudders and relative steering values of different rudders, etc.
7. Comparison of model and ship trial data as regards power, efficiency, wake fraction, etc.

During the year ending November 30, 1923, there were tested for resistance and hull form, 56 models submitted by private firms, as compared to 35 in 1922. Of the 56 tested, 22 were also tried with model screw propellers, against 4 for the preceding year. The greatest reduction in power obtained was 10 percent on the original power at the service speed of the ship, without alteration of either dimensions or displacement.

Aside from what may be termed the regular work, a large amount of original research has been carried out by the staff, not only in the tank but upon ships in service, as well. A notable example of this outside work is found in the investigations of speed and behavior in a seaway, carried on by Mr. Kent and described in his paper before the Institution of Naval Architects last spring.

For the future, a wide range of subjects to be studied is outlined—the effect of fullness of form upon resistance and pitching in waves, the effect of waves and pitching upon revolutions and propulsive efficiency, the determination of limits of thrust upon propellers at various immersions and

Generated on 2024-09-12 12:27 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

friction experiments are a few of the subjects being given extended investigation.

The extent of the study which may be made in a tank, or in connection with one, of all the various matters which are intimately related to the operation of ships is practically limitless. At all times useful; under the present conditions of keenest competition, such work as is being done by the National Tank should prove well nigh invaluable to the British shipowner.

While it does not now seem possible that the construction of a national experimental tank for commercial purposes will ever be warranted in this country, the reduction in naval work should have the effect of making the Washington tank constantly available for private investigations and for research work. Under Admiral Taylor and his successors at the Experimental Model Basin, a most skillful and competent staff of experts has been developed and it is to be hoped that the funds will be constantly forthcoming to keep this organization fully employed, if not on the models of new battleships, in the investigation of the many problems which the development of naval architecture is constantly presenting for solution.

The Laid-Up Ships

ONE of the most difficult problems which confronts the Shipping Board is the ultimate disposal of its surplus vessels.

Except in the event of an extraordinary crisis—in fact, another war—the future active use of a very large proportion of these vessels can hardly be conceived. On the other hand, they are, so far as their hulls are concerned, at least, in a fair state of preservation and with proper care should so continue for a considerable period of time. Their construction cost the country an almost incredible sum and their value, in the mind of the average citizen, is more or less fixed in relation to this sum. This being the case, their deliberate destruction cannot be entered into lightly, even though their maintenance involves an expenditure for which, under ordinary circumstances, no appreciable return can be expected.

There are, in this laid-up fleet, many ships which, considered on their own merits alone, are valuable vessels. There are many others for which it seems improbable that any commercial use can be found. Even in an emergency they would be of doubtful value.

Until a definite policy for their disposal has been decided upon, the potentially competitive ships should be as carefully looked after as circumstances will permit. They still are valuable property and should receive a corresponding amount of care. The balance of the fleet must be kept afloat against the time when they will be turned over to the ship breaker. This event should not be long delayed.

In the meantime the care of all of the laid-up vessels has been turned over to the Ship Sales Department of the Fleet Corporation. The daily press has had much to say regarding these inactive ships. They have been described as "rotting at their moorings," "rapidly disintegrating"—and in other more or less violent terms. Their actual condition is certainly a matter of public concern. With this in mind, we have visited the two largest fleets, containing together something over 500 ships, and investigated the general condition of the vessels and the methods being pursued in caring for them.

Having been engaged in a survey of these same vessels, something over a year ago, we were in a position to judge with some degree of certainty, the rate at which "rotting and disintegration" has proceeded during the past year, and the probability of its continuing in the future.

Elsewhere in this issue will be found a brief description of the condition of the laid-up vessels, as it appeared to the Central Survey Committee, in July, 1923, and also of their present state, as far as the latter could be determined by a necessarily somewhat superficial inspection. An outline of the methods being pursued in caring for these vessels, particularly as regards the more valuable ones, is also given.

Whatever may be one's opinion as to the ultimate disposal of this great mass of floating property, it is of interest to know that the really valuable vessels are being properly and systematically cared for, and that in the two fleets recently visited these same vessels were found in an appreciably better condition than existed 18 months ago.

The determination of a general policy for the disposal of the surplus ships is outside the sphere of the Ship Sales Department. It is merely doing a work which has been assigned to it and, we are very glad to be able to say, doing this work well.

The Diesel Bids

THE bids for furnishing Diesel engines, recently opened by the Fleet Corporation, while interesting, as an indication of the probable cost to the government of this type of machinery, cannot be intelligently compared and interpreted without a study of the data and conditions which accompanied them.

The figures for double acting engines appear favorable and, as it is to be presumed that the bidders on these engines are prepared to meet the stringent requirements of the specifications, there seems to be no reason why they should not be installed in several of the converted ships.

The prices quoted for single acting engines cover a very wide range, and their acceptance or rejection must necessarily involve a large amount of study. All the single acting engines for which bids were offered are of well known and tried types which can be confidently expected to give satisfactory results, if properly installed. As the intent behind the conversion program is, in part at least, to develop and cheapen the manufacture of Diesel machinery in this country, it would seem a wise policy to order engines of several different types even though a somewhat greater expenditure of money is thereby incurred.

The prices for the double acting types are materially lower than the average for the single acting and it seems probable that along this line is offered the greatest possibility of price reduction, a reduction which evidently must come before the Diesel engine, notwithstanding its many and great advantages, can be very generally adopted by the private shipowners of this country.

Generated on 2024-09-12 12:03 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Port Differential Investigation Concluded

Briefs Can Be Filed Within Thirty Days—Shipping Board Consolidation Plan Completed—More Grain Ships Authorized

By Harold F. Lane

WASHINGTON, D. C.

THE hearing before Commissioner Frederick I. Thompson and Examiner H. E. Manghum of the Shipping Board in connection with its investigation into the differential rate situation at present existing in relation to export traffic from North Atlantic, South Atlantic and Gulf ports of the United States, was concluded on October 10, after having consumed four days. At the close permission was given the parties to file briefs within 30 days and Commissioner Thompson stated that oral argument before the board will be granted at a reasonable time after the presentation of briefs by counsel.

Representatives of the steamship lines and rate conferences who were called upon to testify first, before the evidence of the complaints was introduced, seemed somewhat at a loss as to the character of evidence expected of them, but they were informed that they were expected to present facts in justification of the present arrangements. In general they took the position that existing differentials were not unlawful or unduly discriminatory. There was much testimony on behalf of the representatives of the various ports that are complaining of the existing rate situation and W. B. Keene, vice-president in charge of traffic of the Fleet Corporation, was a witness.

A request for joint consideration by the Interstate Commerce Commission and the Shipping Board, as co-ordinate agencies of the federal government with complementary powers over rail and ocean rates, of the cases now pending before the two commissions involving complaints against the present export and import rates and differentials through the various ports, was filed by Clark & La Roe, as counsel for the Port of New York Authority, just prior to the hearing before the Shipping Board, and an effort to bring about a general agreement that such a policy ought to be followed was made at a conference attended by many of the parties to the proceeding before the Shipping Board held at Washington on October 6.

The petition filed with the two bodies states that no part of the nation's rate adjustment has caused such widespread dissatisfaction over a period of many years or has resulted in more litigation than that involving the export and import rates, and that no satisfactory solution will be found until the situation is dealt with in a broad manner commensurate with the importance and aggravated character of the discriminations complained of. An equalization of the ocean rates as to which the export rates are now equalized, it is contended, would place all the ports on a substantial rate parity and quiet for all time, as to these ports, the differential controversies. Permission was requested to appear before the liaison committee of the Shipping Board and the commission in support of the petition, but neither board has yet given any indication of its attitude on the subject.

The conference with a view to bringing about harmony in the matter of port differentials by means of concurrent, if not joint action, by the two commissions, was initiated by Wilbur La Roe, Jr., and Julius Henry Cohen, of counsel for the Port of New York Authority. While no effort was made to have any definite resolutions adopted it was said that the idea seemed to meet general approval.

* * *

CONSOLIDATION PROGRAM COMPLETED

The program of the Shipping Board and the Fleet Corporation for the consolidation of the various services operated by managing agents was completed on September 27, when the board ordered the consolidation of the freight services from South Atlantic ports to United Kingdom and continental ports under the managing agency of the Carolina Company of Charleston, S. C. The name of "American Palmetto Line" was given to the consolidated service. The action of the board eliminates the Tampa Interocean and Trosdal, Plant & La Fonta Companies as managing operators between the ports involved. The three companies have been operating nine ships out of Charleston, Savannah and Jacksonville but under the consolidation plan the Carolina Company will operate but seven. The board instructed the company to make every possible endeavor to complete such an organization as will equally represent the commercial interests of all of the South Atlantic ports.

President Palmer of the Fleet Corporation has prepared a statement showing the result of the consolidations effected, involving 265 vessels, and outlining the service now available. He said that with other economies he believed the consolidations would enable the Fleet Corporation to keep within the $36,000,000 appropriation authorized for the current fiscal year, as against $50,000,000 for the last fiscal year.

* * *

ADDITIONAL SHIPS FOR GRAIN EXPORTS

The Shipping Board has been besieged by grain growers, cotton growers, lumber dealers and shippers generally to put on additional vessels under the American flag in order to ship these commodities to foreign markets at a time when they can get a good sale price. Thousands of letters have been received from the shippers, producers and manufacturers pledging support of the American merchant marine if adequate tonnage is provided, the board announced, and pointing out that any supposed loss in operation is more than offset to the American people in lower freight rates immediately to the benefit of the farmer, producer and manufacturer. Chairman O'Connor of the Shipping Board, on October 7, sent the following communication to Admiral L. C. Palmer, president of the Emergency Fleet Corporation, directing that sufficient additional freight vessels to furnish adequate relief to the American farmers, manufacturers and exporters be put into service where cargoes are offered and heretofore refused because of inadequate tonnage:

"On September 10th last the board directed and authorized you to accede to the demands of American shippers for ships for grain by putting into service ten additional vessels. A great number of protests have since been received, and investigation discloses that this is not sufficient to furnish substantial relief to the shippers. From an American economical standpoint and in the upbuilding of our merchant marine, additional American freight ships to move this grain, lumber and cotton, etc., should be offered at this time. You are, therefore, directed to put into service as quickly as possible sufficient number of vessels to move these American products and furnish the relief requested. Please advise the board as these ships are put into service as to number and location."

* * *

MORE LIBERAL SHIP SALES TERMS

President Palmer of the Fleet Corporation has announced that the Shipping Board has authorized the writing off of 5 percent depreciation from the basic sales prices of the ships in the board's fleet, to cover depreciation from June 30, 1923, when such basic prices were fixed, to June 30, 1924. Depreciation at the rate of 5 percent per annum, calculated progressively on the basic sales prices, will hereafter be written

Generated on 2024-09-12 12:27 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

off semi-annually. President Palmer also announced that the board has authorized the granting of a discount of 2 percent when full purchase price is paid in cash for vessels which are available for sale on the deferred payment plan. This discount is designed to provide for a fair differential to those buyers who are in a position to pay cash, as against the extension of the liberal terms of payment authorized several months ago by the board, under which terms 25 percent may be paid in cash and the balance in ten equal annual installments, with 5 percent interest payable semi-annually. This policy becomes effective at once.

Department of Commerce Agents to Cooperate With Fleet Corporation

Secretary Hoover of the Department of Commerce has issued instructions toward bringing about closer cooperation between Department of Commerce agents in this country and abroad and the representatives of the Fleet Corporation in order to develop more effectively the facilities offered by the government ships. The Bureau of Foreign and Domestic Commerce, which has forty offices in thirty-four foreign countries, managed by men who are familiar with the importance of using American vessels in extending foreign trade, has supplied these agents with full information concerning the Fleet Corporation's services and they will bring to the attention of the Fleet Corporation representatives various opportunities which may develop.

Arrangements have also been made between the State Department and the Fleet Corporation whereby the American consuls abroad have been directed to work in harmony with Fleet Corporation officials.

The Shipping Board on October 7 approved a loan of $1,825,000 to the Eastern Steamship Company of Boston to be applied to the cost of constructing two passenger ships recently completed at the Bethlehem yards at Sparrows Point, Md.

Stevedoring and Terminals Committee

The name of the Fleet Corporation Stevedoring Committee has been changed to the Stevedoring and Terminals Committee. The activities heretofore handled by the staff assistant in charge of piers and wharves are transferred to the jurisdiction of the Stevedoring and Terminals Committee, Edward B. Foote, staff assistant in charge of piers and wharves, being transferred to other duties. H. Y. Saint, chairman of the committee, will be primarily responsible for stevedoring matters, and R. H. Overstreet, secretary of the committee, will be primarily responsible for matters pertaining to terminals. In the absence of Mr. Saint or Mr. Overstreet, the matters pertaining to either stevedoring or terminals will be handled by the member present.

Oil Lubrication of Propeller Tail Shafts

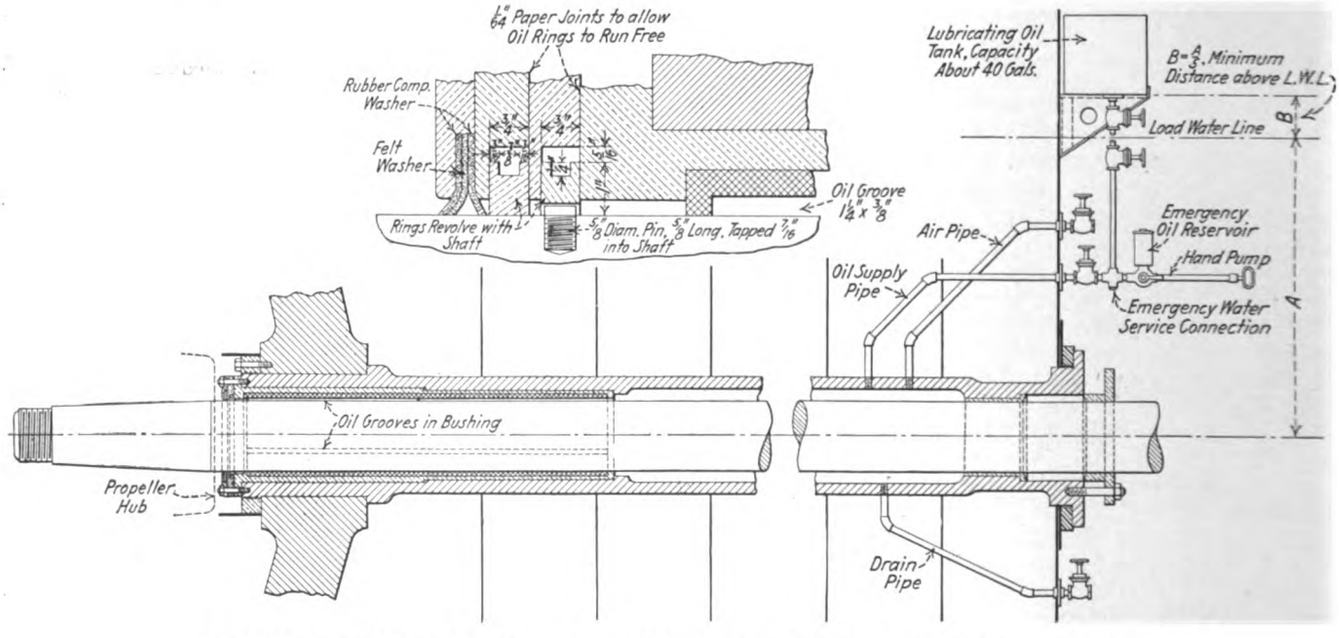
By W. G. Esmond*

NOTWITHSTANDING the far-reaching developments that have taken place in the design of modern vessels and their equipment little or no improvements have been suggested or installed that overcome the tendency to corrosion and pitting of propeller tail shafts. Various means have been tried and of late years continuous liners have been used, extending from the stern stuffing box into the propeller hub. Although costly, these long liners were a cure for the corrosion of the shaft, providing they and the joint at the propeller hub remained perfectly tight, but, if there was a flaw in the manufacture, or any injury in fitting, loosening up, due to vibration or strain of work, through which water could enter underneath the liner, the result was in most cases worse than before, as the corrosion of the shaft was taking place unseen.

In order to avoid this galvanic corrosion, of late years the stern tube has in many cases been filled with oil. Where a suitable fitting can be obtained, which will hold oil in the stern tube, this means has proved an effective cure, provided always that the oil used is non-corrosive and otherwise suitable for the purpose. Given a good fitting and a suitable oil, there is no question that the trouble from galvanic corrosion is practically eliminated.

Certain waters throughout the world are famous for their

* Naval architect, 44 Curtis Place, Stratford, Conn.


1/64" Paper Joints to allow Oil Rings to Run Free
Rubber Comp. Washer
Felt Washer
Rings Revolve with Shaft
5/8 Diam. Pin, 5/8 Long, Tapped 7/16 into Shaft
Oil Groove 1 1/2" x 3/8"
Lubricating Oil Tank, Capacity About 40 Gals.
B = A/3, Minimum Distance above L.W.L.
Load Water Line
Air Pipe
Emergency Oil Reservoir
Hand Pump
Oil Supply Pipe
Emergency Water Service Connection
Oil Grooves in Bushing
Propeller Hub
Drain Pipe

Method of Providing Oil Lubrication for Linerless Steel Shafts on Single Screw Vessels

Generated on 2024-09-12 12:02 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

injury to tail shafts and stern bearings, due to their sandy condition, therefore any arrangement which will keep sand and grit out of the stern tube of ships which frequent such waters should receive the most careful consideration. Another serious trouble is the corrosive nature of the water on some coasts, caused by the decomposition of vegetable and other organic matter brought down by the inland rivers. If the stern tube can be kept full of oil, neither the water nor the sand can enter, and corrosion and wear due to their presence cannot occur. Furthermore, as oil is a much better lubricant than water, the friction in the stern tube bearings must be materially reduced where oil can be used.

Stern tubes, as at present generally installed, are open at their after ends, which allows water, sand, grit, vegetable and other organic matter to enter the stern tube, causing corrosion to take place unseen within the stern tube, which frequently results in the breakage and renewal of tail shafts. Lubrication, or what passes for such, is provided by the water which enters the stern tube, although as a matter of fact water possesses practically no lubricating qualities. Sand, grit and water form an ideal mixture for wear on liners and bushings, increasing vibrations and also, when wear has become excessive, results in a loss of power delivered.

STERN TUBE LUBRICATING APPLIANCES

The McNab-Vickers stern tube appliance, shown in the illustration, is a device manufactured by the McNab Company, Bridgeport, Conn., which provides for the oil lubrication of the tail shaft in lieu of the present method of water lubrication. By the adoption of this installation the costly bronze liners, which now extend half way or for the total length of the tail shaft, can be dispensed with, resulting in a material saving in cost, elimination of the galvanic action, formerly set up by the bronze liners, and a reduction in the wear on shafting and bushes. The appliance provides for the retention of the oil used for lubricating the tail shaft by means of special glands, secured by studs tapped into the stern bushing nut, and by special floating rings secured to the tail shaft and also by special felt and composition washers attached to the glands, the floating rings and washers acting as an oil seal. Means for supplying the lubricating oil are installed in a position above the load waterline of the vessel, and drain and air piping are provided as indicated in the illustration.

A great number of vessels have already been provided with this installation, both single, twin and triple screw types, and from the reports received, the maximum wear on bushings after a period of several years' continuous operation was 1/16 inch, while in a number of cases the wear on the bushes was reported as nil.

LARGER TAIL SHAFTS CAN BE USED

This system of tail shaft lubrication gives all of the advantages of the continuous liner and, where oil is used for lubrication, no liner need be fitted. Therefore, in existing vessels an increased diameter of tail shaft is possible without any, except minor, alterations to the stern post, thus providing additional strength of shafting or a shaft through which more horsepower may be transmitted. Owners contemplating converting some of their craft from steam reciprocating and turbine drives to Diesel power will do well to consider the adoption of oil lubrication for the tail shaft for the reason that a larger and stronger tail shaft, without liners, can be installed in the same stern tube without any alterations whatever. This fact should carry a very strong appeal when the cost of conversion is being considered.

No trouble has been experienced heretofore in making this installation on existing vessels; in fact, the work has frequently been done by the ship's force without any previous instructions. If necessary, the special glands can be made in halves and, where clearance between the bushing nut and forward side of the propeller hub is small, it has been found practicable to provide only one floating ring instead of two used in the majority of cases.

METHOD OF INSTALLING

The installation of this appliance is a simple matter, the following points being given for the guidance of those contemplating an installation:

(a) After withdrawal of the tail shaft, the tubes and bushes should be thoroughly cleaned out and well greased with lubricant before reinstalling the tail shaft.
(b) The glands, metallic packing rings and flexible washers to be placed in the order shown on the illustration, paper joints 1/64 inch only, to be placed between the glands.
(c) Both metallic rings and flexible washers to be well greased before placing in position.
(d) Metallic rings to be a tapping fit on the shaft, so as to rotate with the shaft, care is to be taken that the metallic oil rings are not gripped between the glands.
(e) The rubber and felt flexible washers do not rotate with the shaft.
(f) The stern tube stuffing box at the forward end is to be packed with a hemp packing without rubber core.
(g) The stern tube is to be filled with lubricant before the vessel is floated.
(h) Care to be taken that no air pockets remain in the stern tube.
(i) The exposed part of the tail shaft between propeller hub and patent glands is to be painted over with Stockholm tar or bitumastic solution after stern tube appliance is installed.
This however, does not apply when the shaft is fitted with a brass sleeve or liners.

Although a plain steel shaft running on a good grade cast iron bushing, well lubricated, is hard to beat for its antifrictional properties and negligible wearing qualities, nevertheless, lignum vitæ and bronze liners may be used in connection with the McNab-Vickers system, although it is a needless expense when fitting a new ship with this system.

Linerless steel tail shafts, when provided with a satisfactory means of lubrication, such as the McNab-Vickers system, have been approved by Lloyds, British Corporation, British Board of Trade and other classification societies for installation on ocean going vessels, as well as for many vessels operating on inland waterways, and have given great satisfaction to owners, marine superintendents and engineers responsible for the continuous operation and up-keep of these vessels.

PORTABLE METERS.—Special portable thermo type voltmeters and milliammeters are now on the market. Important applications of these instruments are the measurement of high frequency circuits of moderately low capacity and also low voltage alternating current measurements of ordinary frequencies. The General Electric Company, who makes the meters, has used the D'Arsonval instrument element, mounted in a standard case. This element is actuated, however, from a vacuum thermo-couple, located inside the carrying case, thus making the instrument self-contained. Voltmeters are being made in ranges from 0.75 to 150 volts, and milliammeters can be built for either 20, 25 or 30 milliamperes. The voltmeters are designed to stand loads of 25 to 50 percent in excess of the normal ratings. All the instruments are highly damped. The resistance of the voltmeters is approximately 40 ohms per volt.

ENLARGEMENT OF HAMBURG HARBOR BEING CONSIDERED.—The Hamburg municipality and the chamber of commerce are energetically attempting to carry out plans for increasing the dock and warehousing facilities at the Port of Hamburg, principally by building new docks in the outer harbor below the free port on both sides of the river Elbe, Trade Commissioner Miller, Berlin, writes the Department of Commerce. There is a desire to make dock and port facilities equal to those in the most modern and up-to-date foreign ports in order to maintain Hamburg's comparative position in European freight traffic.

Generated on 2024-09-12 12:04 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Safeguarding the Lives of Lake Seamen*

Lake Ship Safety Committees Reduce Fatalities Nearly Fifty Percent in Six Years of Operation

By George A. Marr†

COINCIDENT with the movement generally undertaken by large industrial concerns to reduce the alarmingly large number of personal injuries a few of the large fleets operating on the Great Lakes many years ago instituted accident prevention measures aboard the bulk freight vessels. Organization and coordinated effort to keep the subject constantly in the mind of the sailors were lacking, indeed, the movement represented little more than a printed set of rules, or "Don'ts," supplemented with warning signs conspicuously placed near the dangerous places abroad ship. The results were only what might have been expected from any immature or partially developed movement.

As the welfare plan of the Lake Carriers' Association had been conceived for the purpose of promoting the well-being of the men who man the ships and, inasmuch as all other efforts of the welfare plan to promote and protect the interests of the men had been encouragingly successful, the welfare committee in 1917 determined to give attention to an amplification and systematic prosecution of this movement to protect the lives and limbs of our seamen. In one sense the time was never more opportune for introducing the safety first idea aboard ship than at that period. Our country was then at war and upon no other arm of transportation did the government more firmly depend for results than upon our lake ships. They had to bring down the iron ore and the grain so essential to our success. I may add that the lake ships were permitted by the government to remain in the hands of their owners and, as there was need that they operate from the earliest to the latest possible periods of navigation, there was also need that the personnel be kept in working condition. The enormous use for men and the lack of qualified man power from which all industries then suffered, resulted in an increasingly large number of personal injuries and it was believed that a properly conducted safety movement was as essential to good steamboat practice as in any other industry.

In another sense it was an unpropitious time for testing out the safety first idea on shipboard, because the men were not ready to receive or to support an innovation of this kind. The high pressure under which the trade was conducted necessitated the impressing into service of many inexperienced men and involved both managements and steamboat officers in a maze of extraordinary demands upon their attention. The rank and file were less responsive to the call of safety and supervision was more difficult because of the conditions prevailing and a lack of knowledge of just what was required in this new undertaking. Under the normal conditions of today with much of our personnel restored, thoughts are normal and the experience of service on the ship committees has trained the men to a practical and intelligent conception of the object sought and the method of its accomplishment.

How well this safety plan was originally conceived may be judged from the fact that it has stood the test of seven seasons of navigation without the welfare committee having found cause for changing any of the conditions or altering the regulations under which the committees operate.

Results of Safety Movement

As to the results of operation, little comfort can be gotten from annual comparisons of the number of accidents. If our experiences of the past seven seasons can be taken as a criterion, he who establishes a safety system and endeavors to measure the success of the venture by comparing one year with another in the matter of a reduced number of personal injuries of a given kind, or, indeed, of the number of injuries of all kinds, will in all likelihood meet with disappointments. A season that furnishes gratification because of the fewer number of injuries reported is apt to be offset the next year by an increased number of casualties. One year the majority of injuries may be sustained by those who slip and fall; another year injuries sustained while handling the cables may come in in increased numbers with a corresponding decrease in the number of injuries of a character that previously had prevailed.

Another difficulty encountered in making comparisons year by year lies in the fluctuating diligence with which officers report personal injuries occurring on their respective boats. Here, again, the personal equation must be dealt with.

The only convincing measure of results lies, therefore, in the comparison of the number of accidents by longer periods than that of single years and the best evidence of accomplishment lies in paralleling the entire reporting period prior to the institution of the prevention measures and the entire period following and reducing each to its annual averages. Even into this there enters the factor of business conditions, a busy year bringing a large number of new men into the trade and a slack season restricting employment to the regular sailor, familiar with his work, used to the lake ships and accustomed to the avoidance of dangerous places and dangerous practices. The statistics which I submit to you with this paper take these varying conditions into consideration and bear unimpeachable testimony to the fact that the Ship Safety Committee is doing a practical and valuable work in the safeguarding of the lives and limbs of the lake seamen.

Conditions During Present Season

Owing to a lean year in lake commerce not all the bulk freighters have been in commission this season and many vessels have at different periods been now in and now out of commission. The maximum number of steamers on which ship safety committees were appointed totals 185. During the five months that have elapsed we have received reports covering the proceedings of 858 meetings held. This approximately equals the monthly average for a total of 1,285 reports received for the full seven-months season of navigation in 1923 when all of the steamers were constantly in commission.

Naturally the ship safety committees center their efforts on safeguarding the lives of their shipmates. In years gone by the heaviest toll in lives on lake ships resulted from falling through open hatches into the cargo holds, falling overboard, falling off ladders or from the dock into the water and by being caught in machinery or cables. Accidents of these characters have been greatly reduced—some nearly eliminated. Vast improvement has been made in the prevention of the loss of lives and, after all, that is the real yardstick by which to measure the value of our ship safety committees.

I have no statistics as to claims paid by vessel companies on account of accidents, but the reduced cost to the underwriter is perhaps indicated in the record of the death benefits paid through provisions of the welfare plan which was

* Abstract of paper delivered at the National Safety Council Congress held at Louisville, Ky., October 1.

† Secretary and Treasurer, Lake Carriers' Association, Cleveland, O.

Generated on 2024-09-12 12:06 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

established in 1909. A compilation shows that in the nine years from 1909 to 1917 inclusive, preceding the inception of ship safety committees, death benefits as a result of fatal accidents (excluding loss of life from shipwreck) were paid for an annual average of 14 men in the forward end of the ship and for an average of 18.1 men in the after end, or engine department. This privilege extends only to employees who accept registration. During this period the average number of sailors registered figures out at 16,584. Thus, the average cost in death benefits paid was $129.67 per thousand registrations. In the six seasons, 1918 to 1923 inclusive, during which we have used ship safety committees on about 50 percent of the steamers in the membership of our association, death benefits as a result of fatal accidents were paid for an annual average of 7 men in the forward end of the ship and for an average of 10 in the after end. With an annual average of 15,930 registrations during these six years this shows that the average cost per thousand has been reduced to $79.77.

Another illuminating compilation shows that in the nine years preceding the adoption of the ship safety committee program there was one person killed for every 940 enrolled in our registration system, while in the six years of committee operations the number of enrollments to each accident fatality is 1,761.

Our ship safety committees now have such a good understanding of the duties involved that they function with little direction or aid from ashore.

Training for an Engineer's License

By David Gaehr*

AS stated in the last issue, the young man starting in as a coal passer or fireman, hoping to qualify for an engineer's berth, should, after serving 36 months in the engineer's department of a steam vessel, have a pretty clear notion of what knowledge he ought to acquire and he must try to make daily advances toward that goal. The "habit of study" must be formed and the "power of observation" must be persistently developed. In order to study effectively, the ambitious beginner must provide himself with such books as will be of real help to him and, in the selection of these books, a word of advice may be helpful.

So many unguided chaps go to a book-store, allow the salesman to persuade them to buy some book with impressive title and alluring cuts, only to find that the language, the presentation of the subject and the very scope leads them "into water over their depth," and, no one being available to teach them to "swim," they give up in discouragement. Presently a renewed impulse causes them to repeat this experience and this time they probably get hold of a "Catechism," in which some things are understandable, but yet they find so many "gaps" and "missing links," because the subject matter is not taken up logically,—rather "hit and miss"—and they do not have the encouraging stimulus resulting from *consciousness of a growing confidence accompanying* the *acquisition* of *knowledge* of the fundamental principles underlying the operation of the equipment handled.

THE BEGINNER'S LIBRARY

Therefore, aside from some good textbook on English and a dictionary (ever to be kept near at hand to look up the meaning of words and their correct spelling—*never guess, look it up*), an arithmetic, a simple text-book in physics covering the subject of *heat*, so as to understand the sooner the principles involved in steam generation, and a textbook on "General Science" are quite sufficient for making a good start on the road to knowledge. Any teacher or educated friend can give substantial assistance in the selection of these books.

It is not always necessary to begin reading a book on the first page. Many books are well suited to be considered as "reference works," to which one can turn and, in a complete index, readily find the place in which the answer to a question just raised in connection with the work can be found.

FUNDAMENTAL LAWS SHOULD BE UNDERSTOOD FIRST

The immensity of the information required for a thorough understanding of all marine machinery is bewildering, unless one concerns himself chiefly with the mastery of *fundamental laws*, which will at once explain many things, i.e., one law understood making many puzzling features self-explanatory, whereas in the "Question and Answer" process as many answers must be given as there are puzzles. In brief, the student must *learn to reason and think*, else he becomes a mere automaton, unable to do anything intelligently.

With such a small library, the student should layout his daily assignment, to be conscientiously taken up when off watch.

STUDY ESPECIALLY THE APPARATUS TO WHICH YOU ARE ASSIGNED

While employed in the fireroom, the student should not concern himself directly with engines, pumps, steering gear, deck engines, etc., but give his first attention to the things in the firehold. Whenever opportunity is presented, he should go into a boiler and take special note of the construction details, defects, etc., then go into the furnaces, combustion chamber, etc., study all boiler mountings, learning the meaning, construction and operation of *every* fitting and connection, trace out pipe lines, and learn the correct names of all these parts. He should study coal, why some of it causes more trouble than others, why clinkers, or undue amounts of ash, are formed. He should study the best *methods* of firing (this can be developed to a fine "science") and of cleaning fires, how to get the best results out of various kinds of coal and to "keep up steam" even under great handicap. He should study the purpose and action of "draft" and the various appliances connected with getting it. In fact, a thorough-going "cadet engineer" ought to be unwilling to leave the fireroom until he feels himself thoroughly familiar with everything there, including the fitting out and laying up and testing of boilers, and *most of that knowledge is gained by experience and observation.* He ought to keep his mind fresh by doing some regular reading, else later on, when he has the more difficult problems of the engine-room to tackle, he will find his brain too sluggish to respond, because of an accumulation of "cobwebs." The brain, like any other part of our make-up, requires constant exercise.

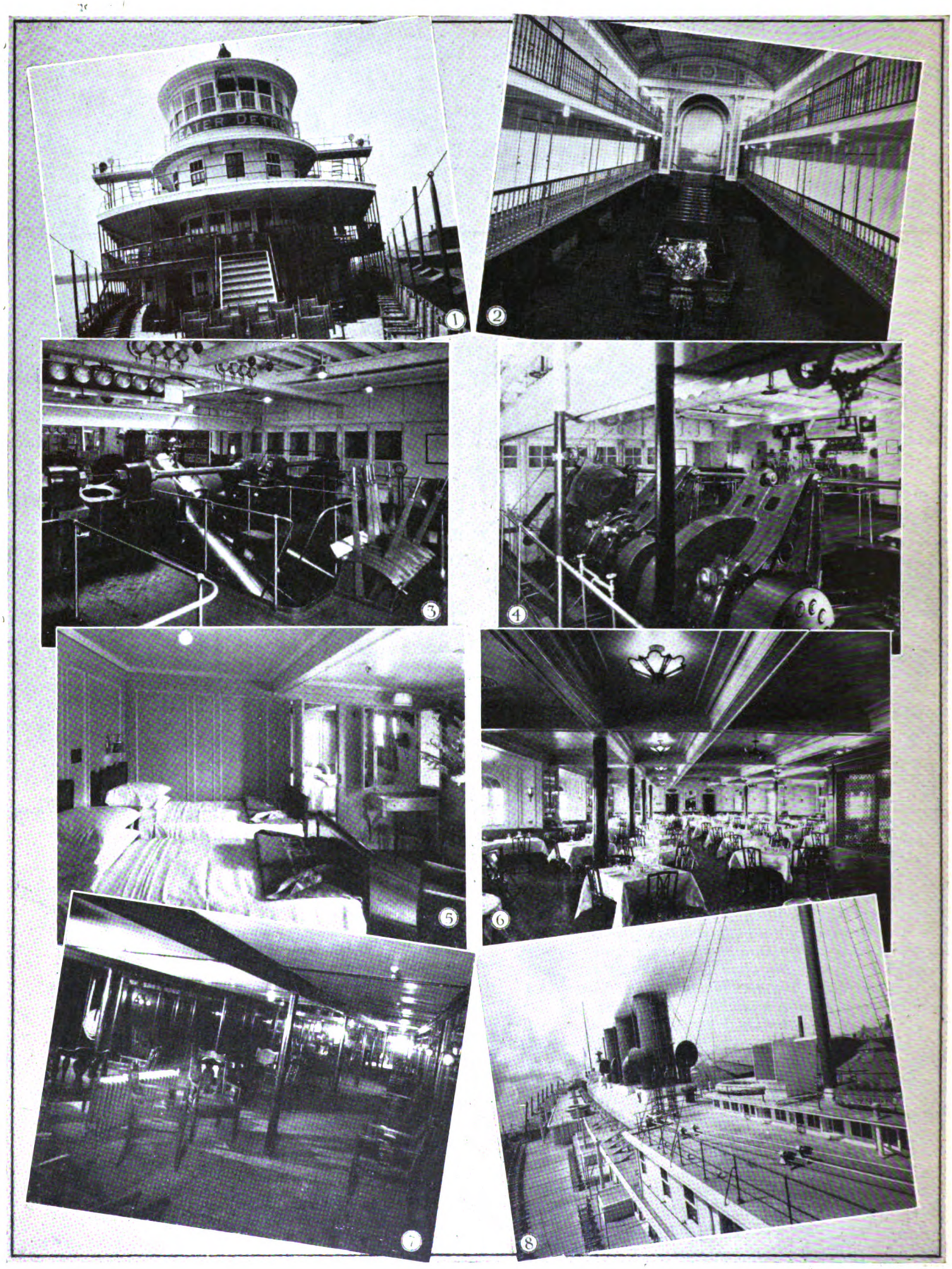
BOOKS THAT ARE BOTH ENTERTAINING AND INSTRUCTIVE

"All work and no play makes Jack a dull boy," however, and, therefore, it is necessary to do some "light" reading, like newspapers, going over general news and political issues. Magazines like "Sea Stories," which have some interesting and more or less instructive material to offer from time to time, any of Conrad's books on sea-faring life are good recreational reading, and uniquely interesting books like "McAndrews' Floating School" and "The Professor on Shipboard" cannot be too highly recommended as both entertaining and instructive.

In the Questions and Answers Department of *this very publication* some *very helpful information* for prospective engineers is at times found, such as, for instance, a concise enumeration of boiler defects and most likely places in which deterioration is found, and these, no doubt, can be reprinted from time to time as there is found specific demand for them or other information of like character.

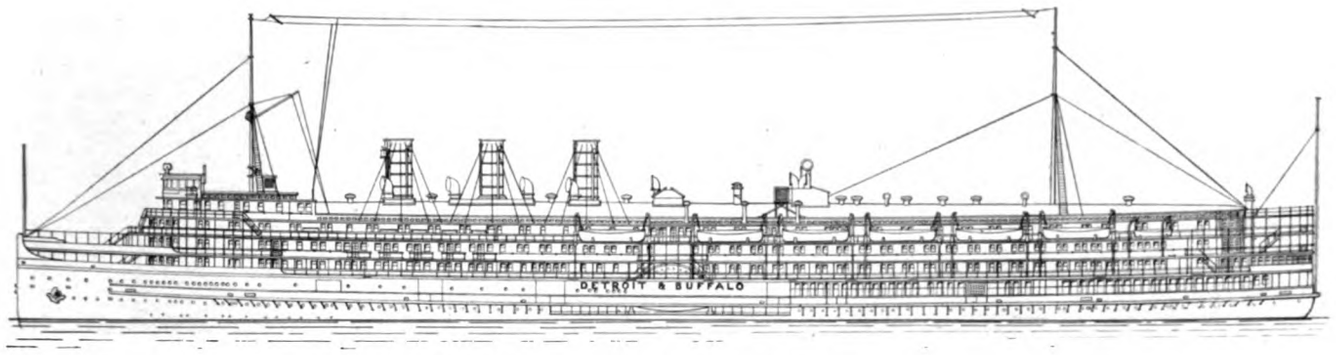
* In charge of School of Marine Engineering, Lake Carriers' Association, Cleveland, O.

Generated on 2024-09-12 12:03 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN



Great Lakes Passenger Steamer Greater Detroit: (1) Pilot House and Navigating Bridge, (2) Grand Saloon, (3) and (4) Engine Room, (5) De Luxe Stateroom, (6) Dining Room, (7) Grand Saloon, (8) Boat Deck, Looking Aft

Generated on 2024-09-12 12:02 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN



Outboard Profile of Steamer Greater Detroit

The Largest Paddle Steamers Ever Built

Great Lakes Steamers Greater Detroit and Greater Buffalo Built by the American Ship Building Company for the Detroit and Cleveland Navigation Company

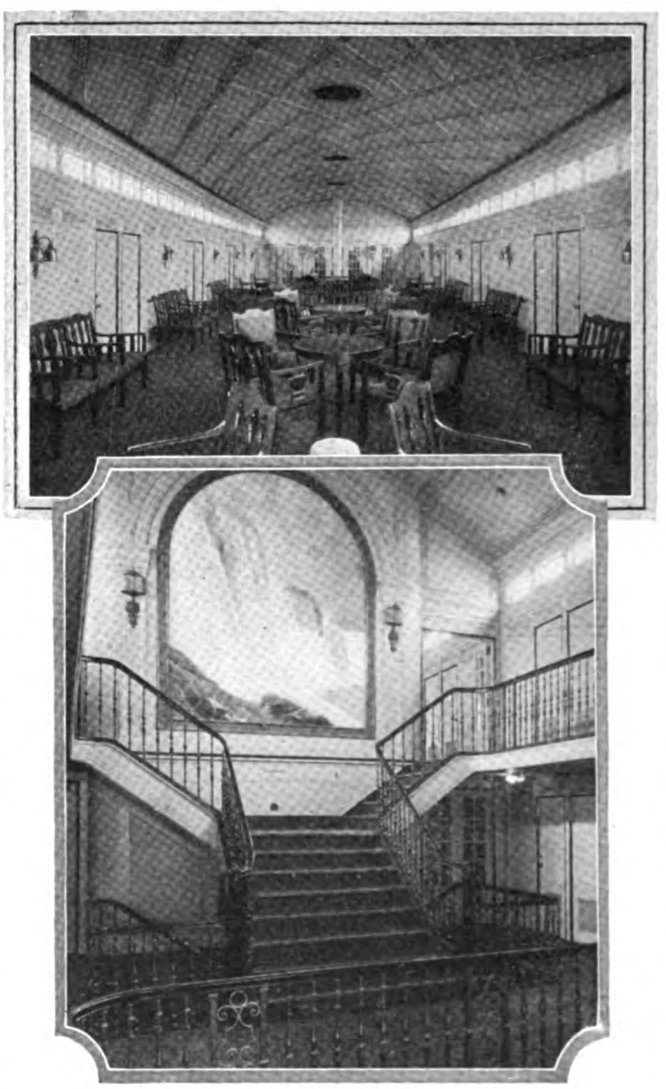
THE twin steamers, *Greater Buffalo* and *Greater Detroit* are not only the largest vessels of their class ever constructed on the Great Lakes but are undoubtedly the largest vessels ever built to be propelled by paddle wheels alone. The only ship of greater dimensions using paddle wheels was the *Great Eastern*, but she was also provided with a screw propeller, and, properly speaking, was a steamship, and not a steamer, as known in this country.

In our September issue, there appeared a short description of these remarkable vessels, and in the present number we are enabled, through the courtesy and cooperation of the builders and owners (the American Ship Building Company, Cleveland, O., and the Detroit & Cleveland Navigation Company, Detroit, Mich.), to present plans showing the general arrangement and construction as well as photographs showing the passenger accommodations.

The principal dimensions of the vessels are as follows:

Length, overall	535 ft.
Length, between perpendiculars	519 ft.
Beam, molded	58 ft.
Beam, over guards	96 ft. 6 in.
Depth, molded	23 ft. 7 in.
Depth, at guard	22 ft. 10 in.

The hull is constructed of steel, with joggled transverse framing and a complete double bottom extending all fore and aft. An unusual feature is a bow rudder, to facilitate handling in narrow waters. There are 10 watertight bulkheads, extending up to the main deck. Bitumastic paint and enamel is applied to the tank top, bilges, bottom of foundations and coal bunkers. The main deck beams are of channel section, spaced 5 feet, the plating between them being supported by longitudinal bulb angles. The promenade deck is supported by I-beams spaced 15 feet centers, these carrying longitudinal I-beams which in turn carry the wooden deck carlins, as shown on the midship section, a somewhat novel method of construction.

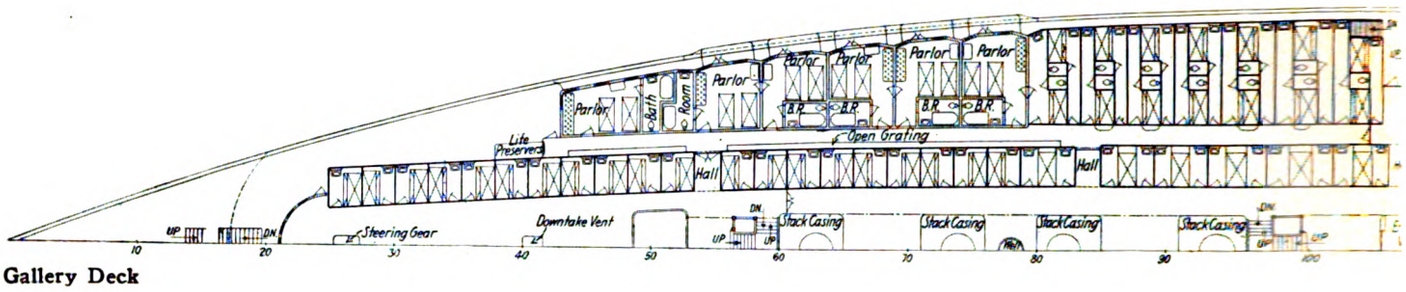


(Upper) Saloon on Upper Deck
(Lower) Staircase in Main Saloon

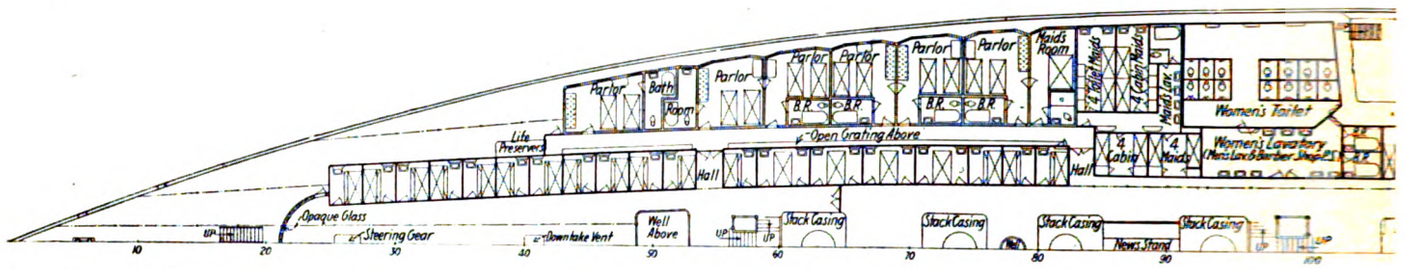
A steel orlop deck, sloping down to a gutter at the center of the vessel, is fitted forward and aft of the machinery spaces. The forward portion of this deck is utilized for sleeping quarters for the deck crew, firemen and waiters. Aft of the machinery space, on the orlop deck, are the galley, refrigerators, storerooms, etc.

On the main deck, at the forward end, are rooms for engineers, oilers and electricians, between these and the engine casing, a large space for deck freight, and aft, a cafeteria, the main entrance

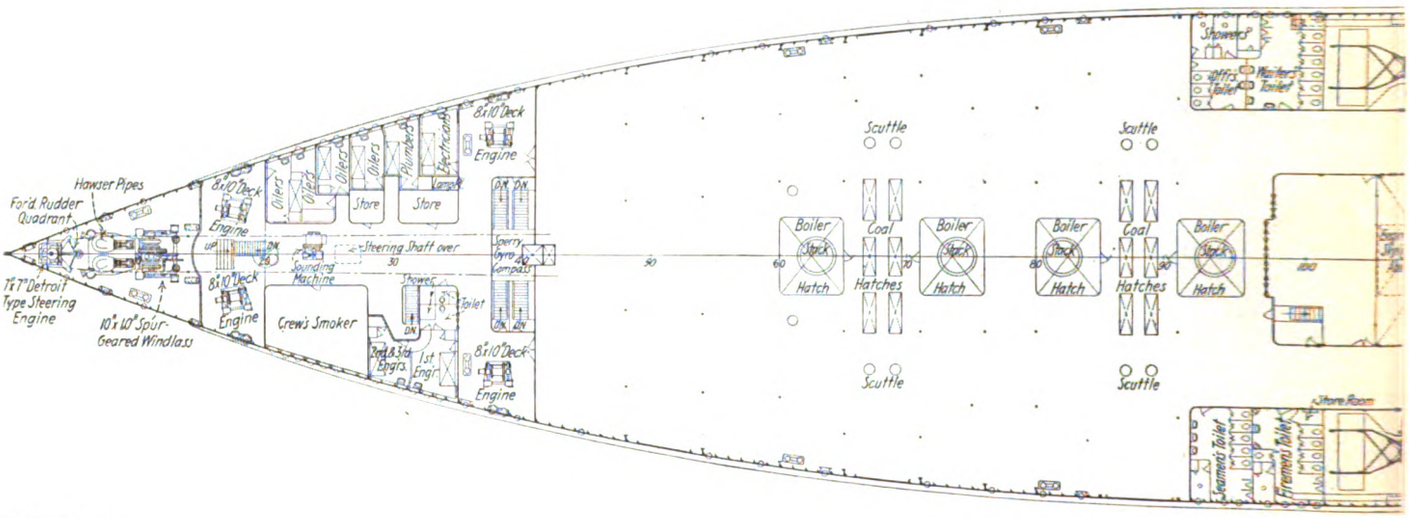
Generated on 2024-09-12 12:04 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN



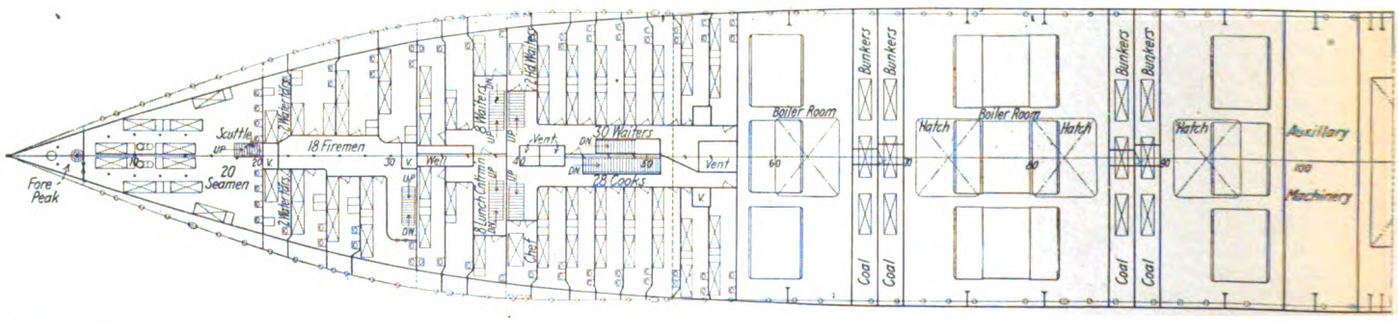
Gallery Deck



Promenade Deck



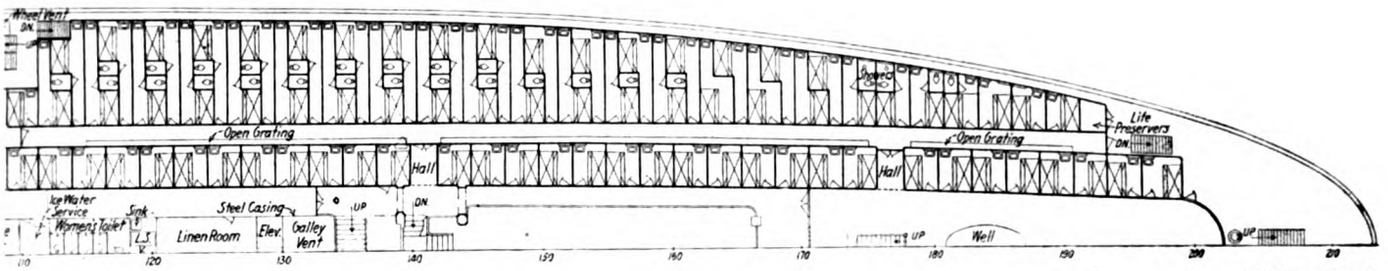
Main Deck



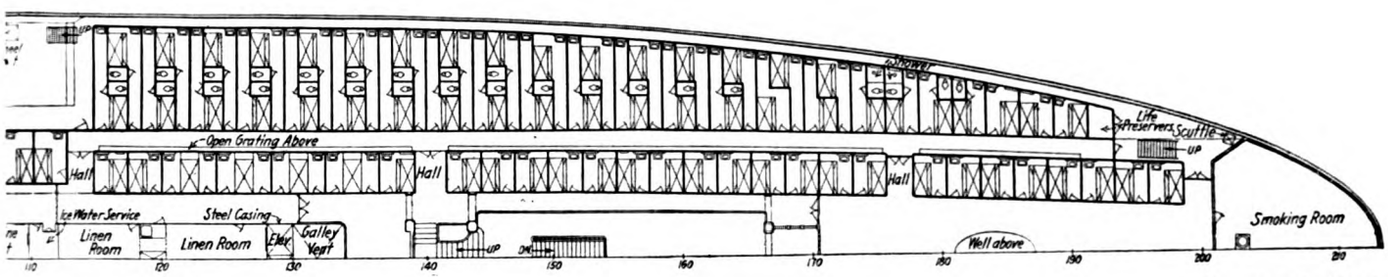
Orlop Deck

Deck Plans of the Detroit and Cleveland

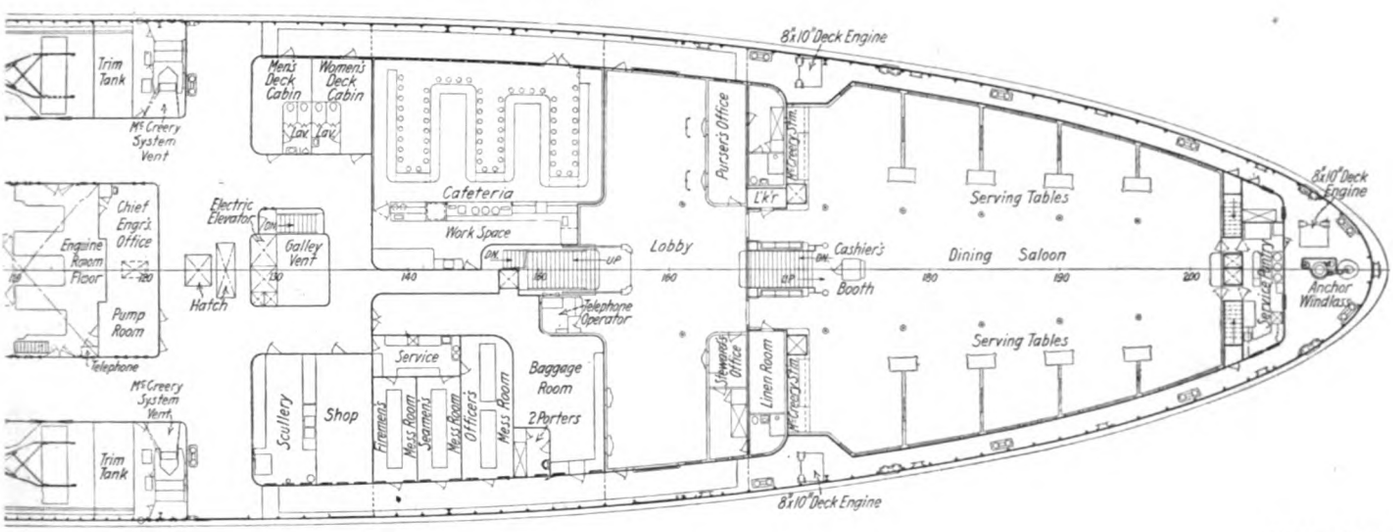
Generated on 2024-09-12 12:04 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN



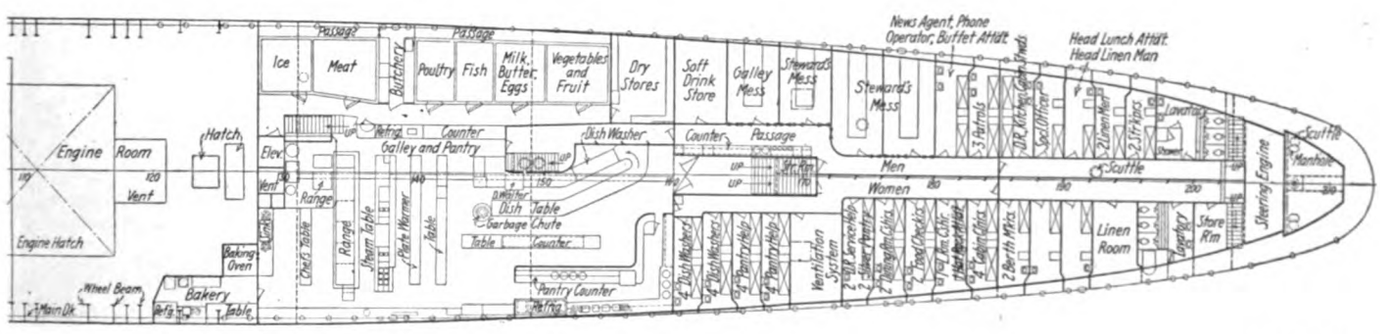
Gallery Deck



Promenade Deck



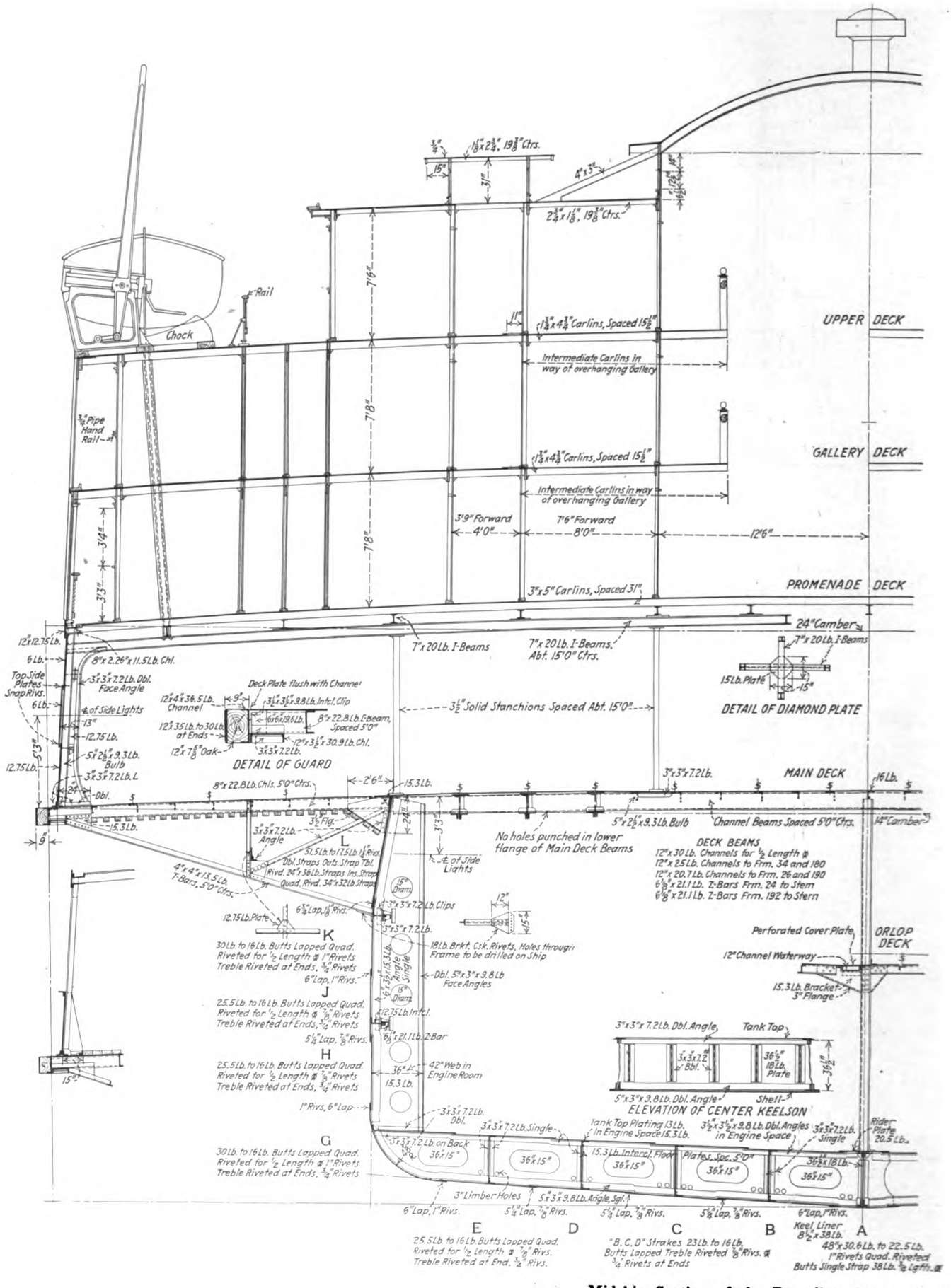
Main Deck



Orlop Deck

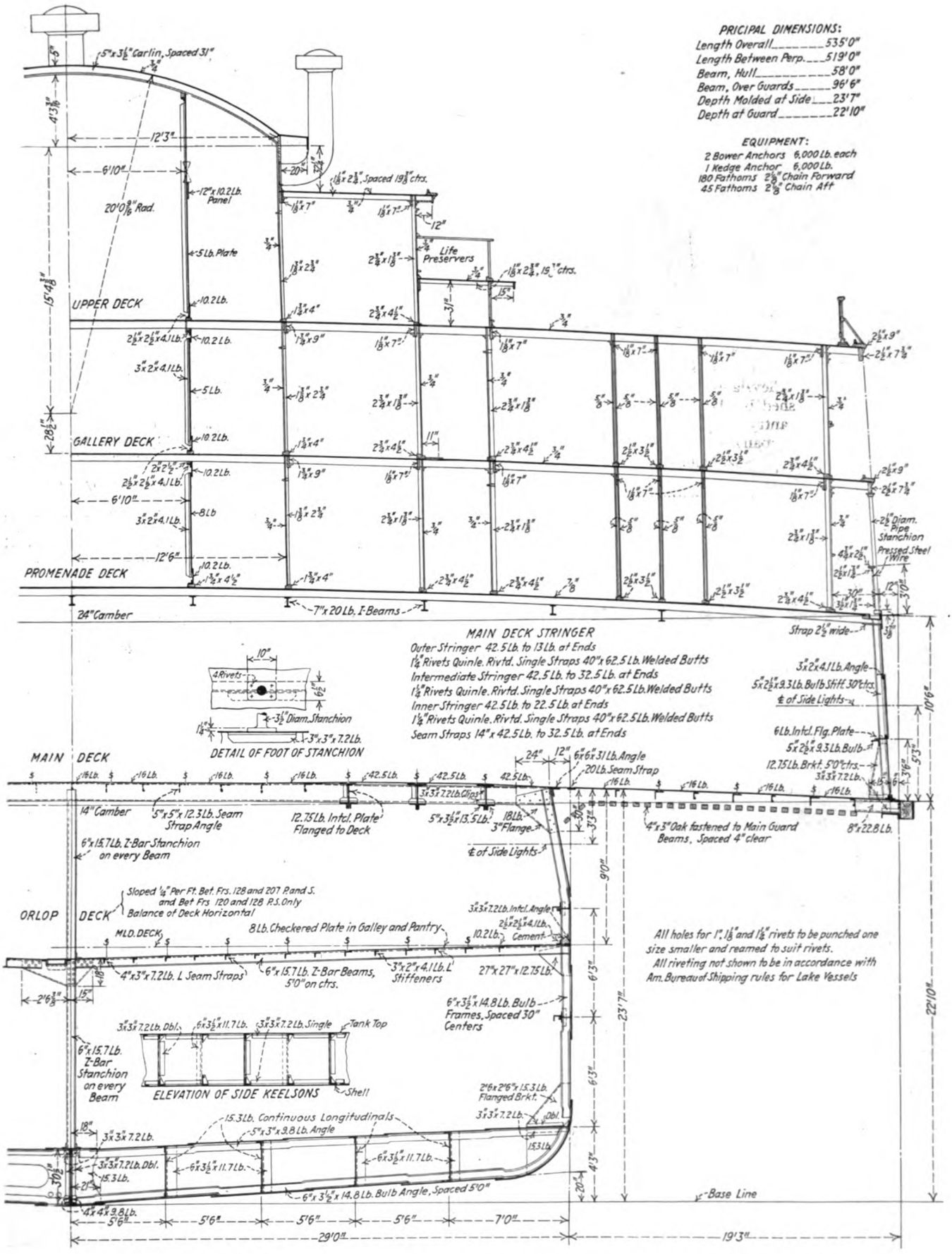
Navigation Company's Side Wheel Steamer Greater Detroit

Generated on 2024-09-12 12:18 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN


UPPER DECK
GALLERY DECK
PROMENADE DECK
MAIN DECK
ORLOP DECK
Rail
Chock
3/4" Pipe Hand Rail
7'6"
7'8"
3'4"
3'3"
1 1/8" x 2 3/4", 19 3/8" Ctrs.
4" x 3"
2 3/4" x 1 1/8", 19 3/8" Ctrs.
1 3/4" x 4 3/4" Carlins, Spaced 15 1/2"
Intermediate Carlins in way of overhanging Gallery
3" x 5" Carlins, Spaced 31"
3'9" Forward
4'0"
7'6" Forward
8'0"
12'6"
24" Camber
7" x 20 Lb. I-Beams
7" x 20 Lb. I-Beams, Abt. 15'0" Ctrs.
15 Lb. Plate
DETAIL OF DIAMOND PLATE
3 1/2" Solid Stanchions Spaced Abt. 15'0"
12" x 4" x 36.5 Lb. Channel
12" x 35 Lb. to 30 Lb. at Ends
12" x 7/8" Oak
Deck Plate flush with Channel
3 1/2" x 3 1/2" x 9.8 Lb. Intcl. Clip
8" x 22.8 Lb. I-Beam, Spaced 5'0"
12" x 3 1/2" x 30.9 Lb. Chl.
DETAIL OF GUARD
Top Side Plates Snap Rivs.
8" x 2.26" x 11.5 Lb. Chl.
3" x 3" x 7.2 Lb. Dbl. Face Angle
12.75 Lb.
5" x 2 1/2" x 9.3 Lb. Bulb
3" x 3" x 7.2 Lb. L
8" x 22.8 Lb. Chls. 5'0" Ctrs.
15.3 Lb.
3" x 3" x 7.2 Lb. Angle
3 1/2" Flg.
31.5 Lb. to 17.5 Lb. 1 1/4" Rivs.
Dbl. Straps Outs. Strap Tbl.
Rivd. 24" x 36 Lb. Straps Ins. Strap Quad, Rivd. 34" x 32 Lb. Straps
4" x 4" x 13.5 Lb. T-Bars, 5'0" Ctrs.
6 1/2" Lap, 1" Rivs.
12.75 Lb. Plate
K
30 Lb. to 16 Lb. Butts Lapped Quad. Riveted for 1/2 Length @ 1" Rivets Treble Riveted at Ends, 3/4" Rivets
6" Lap, 1" Rivs.
J
25.5 Lb. to 16 Lb. Butts Lapped Quad. Riveted for 1/2 Length @ 7/8" Rivets Treble Riveted at Ends, 3/4" Rivets
5 1/2" Lap, 7/8" Rivs.
H
25.5 Lb. to 16 Lb. Butts Lapped Quad. Riveted for 1/2 Length @ 7/8" Rivets Treble Riveted at Ends, 3/4" Rivets
1" Rivs, 6" Lap
G
30 Lb. to 16 Lb. Butts Lapped Quad. Riveted for 1/2 Length @ 1" Rivets Treble Riveted at Ends, 3/4" Rivets
6" Lap, 1" Rivs.
E
25.5 Lb. to 16 Lb. Butts Lapped Quad. Riveted for 1/2 Length @ 7/8" Rivs. Treble Riveted at End, 3/4" Rivs.
D
5 1/2" Lap, 7/8" Rivs.
C
"B, C, D" Strakes 23 Lb. to 16 Lb. Butts Lapped Treble Riveted 7/8" Rivs. @ 3/4" Rivets at Ends
B
5 1/2" Lap, 7/8" Rivs.
A
6" Lap, 1" Rivs.
Keel, Liner 8 1/2" x 38 Lb.
48" x 30.6 Lb. to 22.5 Lb. 1" Rivets Quad. Riveted Butts Single Strap 38 Lb.
No holes punched in lower flange of Main Deck Beams
DECK BEAMS
12" x 30 Lb. Channels for 1/2 Length @
12" x 25 Lb. Channels to Frm. 34 and 180
12" x 20.7 Lb. Channels to Frm. 26 and 190
6 1/8" x 21.1 Lb. Z-Bars Frm. 24 to Stem
6 1/8" x 21.1 Lb. Z-Bars Frm. 192 to Stern
Channel Beams Spaced 5'0" Ctrs.
14" Camber
16 Lb.
3" x 3" x 7.2 Lb.
5" x 2 1/2" x 9.3 Lb. Bulb
Perforated Cover Plate
12" Channel Waterway
15.3 Lb. Bracket 3" Flange
3" x 3" x 7.2 Lb. Clips
18 Lb. Brkt. C.s.k. Rivets, Holes through Frame to be drilled on Ship
Dbl. 5" x 3" x 9.8 Lb. Face Angles
12.75 Lb. Intcl.
6 1/8" x 21.1 Lb. Z-Bar
42" Web in Engine Room
3" x 3" x 7.2 Lb. Dbl. Angle
Tank Top
3" x 3" x 7.2 Bbl.
36 1/2" 18 Lb. Plate
5" x 3" x 9.8 Lb. Dbl. Angle
Shell
ELEVATION OF CENTER KEELSON
Tank Top Plating 13 Lb. in Engine Space 15.3 Lb.
3 1/2" x 3 1/2" x 9.8 Lb. Dbl. Angles in Engine Space
Rider Plate 20.5 Lb.
3" x 3" x 7.2 Lb. on Back
3" x 3" x 7.2 Lb. Single
15.3 Lb. Intercl. Floor Plates, Spc. 5'0"
3" Limber Holes
5" x 3" x 9.8 Lb. Angle, Sgl.
36" x 15"
36" x 18 Lb.

Midship Section of the Detroit and Cleveland

Generated on 2024-09-12 12:03 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN


PRICIPAL DIMENSIONS:
Length Overall 535'0"
Length Between Perp. 519'0"
Beam, Hull 58'0"
Beam, Over Guards 96'6"
Depth Molded at Side 23'7"
Depth at Guard 22'10"
EQUIPMENT:
2 Bower Anchors 6,000 Lb. each
1 Kedge Anchor 6,000 Lb.
180 Fathoms 2⅞" Chain Forward
45 Fathoms 2⅞" Chain Aft
UPPER DECK
GALLERY DECK
PROMENADE DECK
MAIN DECK
ORLOP DECK
MLD. DECK
Life Preservers
24" Camber
14" Camber
MAIN DECK STRINGER
Outer Stringer 42.5 Lb. to 13 Lb. at Ends
1¼" Rivets Quinle. Rivtd. Single Straps 40" x 62.5 Lb. Welded Butts
Intermediate Stringer 42.5 Lb. to 32.5 Lb. at Ends
1¼" Rivets Quinle. Rivtd. Single Straps 40" x 62.5 Lb. Welded Butts
Inner Stringer 42.5 Lb. to 22.5 Lb. at Ends
1¼" Rivets Quinle. Rivtd. Single Straps 40" x 62.5 Lb. Welded Butts
Seam Straps 14" x 42.5 Lb. to 32.5 Lb. at Ends
DETAIL OF FOOT OF STANCHION
ELEVATION OF SIDE KEELSONS
Sloped ¼" Per Ft. Bet. Frs. 128 and 207 P. and S. and Bet Frs 120 and 128 P.S. Only
Balance of Deck Horizontal
8 Lb. Checkered Plate in Galley and Pantry
6" x 15.7 Lb. Z-Bar Stanchion on every Beam
6" x 15.7 Lb. Z-Bar Beams, 5'0" on ctrs.
6" x 3½" x 14.8 Lb. Bulb Frames, Spaced 30" Centers
6" x 3½" x 14.8 Lb. Bulb Angle, Spaced 5'0"
15.3 Lb. Continuous Longitudinals
Tank Top
Shell
Base Line
Strap 2½" wide
3" x 2" x 4.1 Lb. Angle
5" x 2½" x 9.3 Lb. Bulb Stiff. 30" ctrs.
℄ of Side Lights
6 Lb. Intcl. Flg. Plate
12.75 Lb. Brkt. 5'0" ctrs.
4" x 3" Oak fastened to Main Guard Beams, Spaced 4" clear
8" x 22.8 Lb.
All holes for 1", 1⅛" and 1¼" rivets to be punched one size smaller and reamed to suit rivets.
All riveting not shown to be in accordance with Am. Bureau of Shipping rules for Lake Vessels
29'0"
19'3"

Navigation Company's Side Wheel Steamer Greater Detroit

Generated on 2024-09-12 12:04 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

lobby and the dining saloon. A large trimming tank is fitted aft of each paddle wheel.

The promenade, gallery and upper decks are given over, practically entirely, to passenger stateroom accommodations.

The public rooms are, as indicated by the illustrations, elaborately and tastefully decorated, the main saloon ceiling and alcoves being decorated by Di Lorenzo of New York. The paneling in the dining saloon, lobby and under the dome and gallery ceilings is of vehisote.

Haskelite enters extensively into the joiner construction, about 20,000 square feet of this material, the finish varying to suit the surrounding work, being used in each vessel.

The furniture was designed and furnished by Sloane & Company of New York.

Asbestolith flooring is laid in the dining room, smoking room, linen rooms, deck cabins, coffee room and crew's mess room, and rubber tiling on all inside stairs, lobby and inside the entrance of all outside cabin doors. Gold Seal Treadlite tile is used in the public toilets and private baths and Gold Seal cork tile in the pilot house.

A complete washed air ventilating system, designed by Ernest Szekely, of Cleveland, is installed, the fans and washers being furnished by the American Blower Company.

The galley and pantry equipment was furnished by the O'Connor-Stevens Company, of Detroit, and the electric fixtures by the Sterling Bronze Company, of New York.

Deck Machinery

The following deck machinery and gear is installed:

1 windlass, forward, American Engineering Company, spur geared, double 10-inch by 10-inch engines. 2 bower anchors, 6,000 pounds each and 180 fathoms 2⅛-inch chain.
1 windlass, aft, American Engineering Company. 1 anchor, 6,000 pounds, 45 fathoms 2⅛-inch chain.
2 steering engines, aft, American Ship Building Company, double engine 9 inches by 9 inches, interchangeable on to common quadrant.
1 steering engine, forward, American Ship Building Company, double engine, 7 inches by 7 inches.
5 deck engines with winch heads, American Ship Building Company, double, 8 inches by 10 inches.
2 deck engines without winch heads, American Ship Building Company, double, 8 inches by 10 inches.
1 motor driven garbage expeller by the American Ship Building Company.

There are 12 lifeboats carried on the upper deck under mechanical davits, both boats and davits being furnished by the Steward Davit and Equipment Company. Boat winches, designed and built by the American Ship Building Company under Captain Jacques' patents, are installed.

Propelling Machinery

Propulsion is by side feathering paddle wheels, 30 feet in diameter, driven at a normal speed of 31 revolutions per minute by a 3-cylinder compound inclined engine with cylinders 66 inches, 96 inches and 96 inches diameter by 108 inches stroke, developing 12,000 indicated horsepower at the above revolutions and giving the ship a speed of 21 miles per hour.

Steam is furnished at 167 pounds per square inch working pressure and 50 degrees superheat by 6 single ended and 3 double ended Scotch boilers having a total heating surface of 25,500 square feet and a total grate area of 594 square feet. The single ended boilers are 14 feet diameter by 10 feet 6 inches long and the double ended boilers 14 feet 2 7/16 inches mean diameter by 20 feet 6 inches long.

We expect to publish plans of this machinery in an early issue.

Auxiliaries

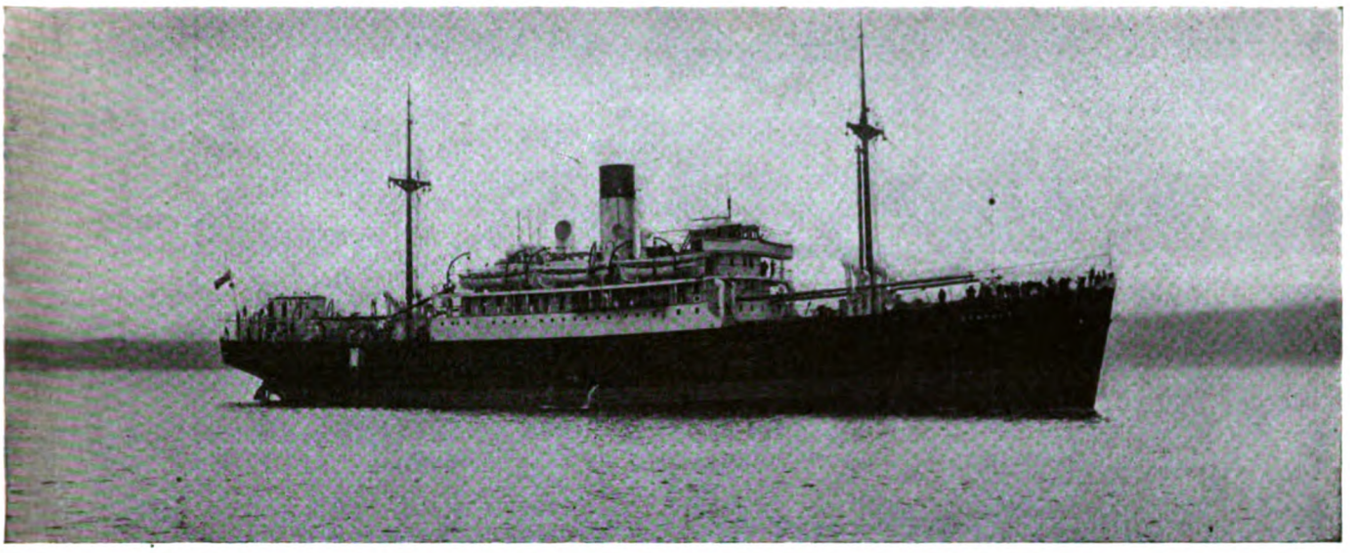
The following auxiliaries are installed:

Two attached main feed pumps, 8 inches by 41½ inches stroke, American Ship Building Company.
One auxiliary feed pump, 16 inches by 12 inches by 28 inches, Warren vertical simplex.
One general service pump, 16 inches by 12 inches by 28 inches, Warren vertical simplex.
Two attached bilge pumps, 8 inches by 41½ inches stroke, American Ship Building Company.
One ballast pump, 14-inch centrifugal, Morris Company; steam engine, 8 inches by 14 inches by 10 inches.
Two combined sanitary and bilge pumps, 14-inch steam, 12-inch sanitary, 6-inch bilge, 12-inch stroke, Dean horizontal duplex.
One underwriters fire pump, 16 inches by 9 inches by 12 inches, Warren horizontal duplex.
One underwriters sprinkler pump, 16 inches by 9 inches by 12 inches, Warren horizontal duplex.
Two raw water pumps, 8 inches by 10 inches by 12 inches, Dean vertical duplex.
Two fresh water pumps, 5¼ inches by 4¾ inches by 5 inches, Union horizontal duplex.
Two sterilized water pumps, 5¼ inches by 4¾ inches by 5 inches, Union horizontal duplex.
Two ice water pumps, 4½ inches by 2¾ inches by 4 inches, Union horizontal duplex.
Two heating system vacuum pumps, 5½ inches by 8 inches by 7 inches, Dean horizontal duplex.
One brine pump, 6 inches by 5¾ inches by 6 inches, Union horizontal duplex.
Two attached main air pumps, 62 inches by 41½ inches stroke, American Ship Building Company.
Two jet condensers.
One auxiliary condenser and air pump (jet condenser), 14-inch steam, 28-inch air, 18-inch stroke, Dean vertical simplex.
Four forced draft fans, American Blower Company; double vertical engine, 7 inches by 7 inches.
One turning engine, horizontal duplex, 10 inches by 10 inches, American Ship Building Company.
One refrigerating machine, 20 tons capacity; Prosser horizontal steam engine; Kroeschell compressor.
Three 100-kilowatt turbine-driven generators, 125 volts, 2-wire, direct current, Terry turbine; Allis Chalmers generator.
Four radojets, type "G," C. H. Wheeler.

Standardized Diesel Engines

LEAVING aside the controversial question of two-stroke *versus* four-stroke cycle, the marked diversity of opinion regarding the best type of marine Diesel engine and the total absence of anything approaching a standardized design or universal type to-day is remarkable. It is interesting to review a few of the well-known types of Diesel propelling machinery in use to-day or in the course of construction. There is the normal single-acting engine of both cycles, and the opposed-piston type as exemplified in the Doxford and Camellaird-Fullagar engines. Of the double-acting type we have the North British, the Burmeister & Wain and the M.A.N., the latter functioning on the two-stroke cycle. The Scott Still Diesel-cum-Steam is also virtually a double-acting unit, and all of the foregoing are directly coupled to the propeller shaft. In Germany the light high-speed engine of submarine type has been sucessfully applied in association with single-reduction flexible mechanical gearing, thereby securing a certain reduction in engine weight and height and freedom from gearing troubles arising from torsional oscillations. The latest additions to an already formidable array of machinery arrangements is the Vulcan gear, whereby the power of the Diesel is transmitted to the propeller through single-reduction spur gearing and also through a fluid clutch which eliminates the necessity for providing reversing gear on the engine proper. That all of these types have been proved commercially workable may be taken as evidence that each has something to recommend it, but it may not be too much to hope that advance of time and accumulation of experience will evolve a marine Diesel engine of universal type which will lend itself to standardized manufacture, will simplify the problem of the shipowner in deciding on the type of machinery for new tonnage and, most important of all, will hold out some promise of reduced initial cost. Leading German engineers are convinced that the double-acting two-stroke cycle engine is the marine Diesel engine of the future.—*Shipbuilding and Shipping Record.*

Generated on 2024-09-12 12:04 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN



Single Screw, 3,000-Ton, Passenger and Cargo Motorship Centaur for the Singapore-West Australia Service of the Straits Steamship Company (Alfred Holt and Company)

Mixed Cargo and Passenger Motorships

The Centaur Built for the Eastern Trade and the City of San Francisco for Pacific Coast Service

By Our Special London Correspondent

THE oil engine is now breaking fresh ground and is being applied to the propulsion of types of vessels which have not hitherto been considered specially suitable for motor drive. Two recent examples are to be found in the *Centaur* and *City of San Francisco* which have just been completed at European yards, the former on the Clyde and the latter at Gothenburg in Sweden. They are comparatively small ships and are designed both for passenger and cargo carrying.

The *Centaur* is the first motorship to engage in the trade on which she will be placed in service, namely, between Singapore and Western Australia. The owners are the Straits Steamship Company of Singapore, which is now practically the same as Messrs. Alfred Holt & Company. One of the objects of the new ship is to pick up passengers at coastal ports in Western Australia, and convey them to Fremantle or Singapore, in order that they may join Holt's larger liners.

Main Particulars of the Centaur

The length of the *Centaur* is 315.7 feet with a beam of 48.2 feet, and she carries about 3,000 tons deadweight, the speed at sea being 12 knots. There is passenger accommodation for about 110 in the first saloon, the majority of the cabins being of the four-berth type. At the after end of the vessel are arranged cabins for some 40 second-class passengers.

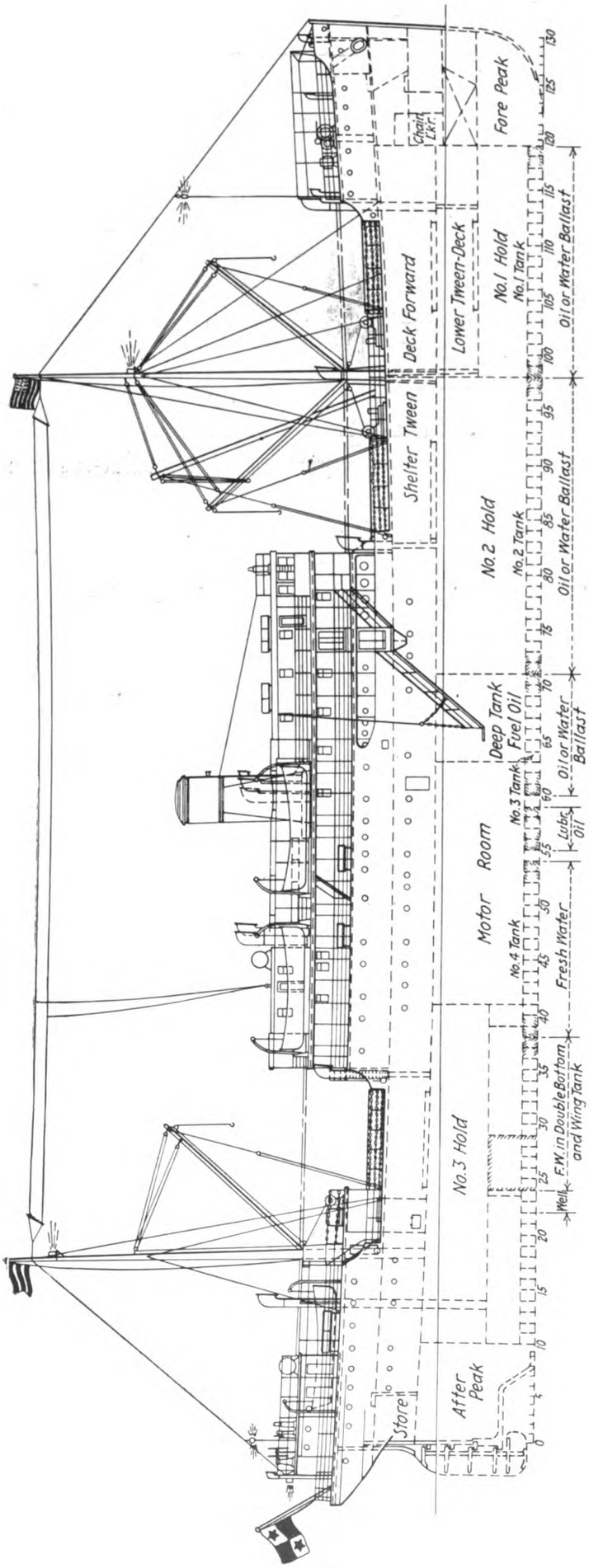
The *Centaur* has a single-screw installation, the propelling engine being a six-cylinder long-stroke 2,000 indicated horsepower Burmeister & Wain set which runs at 110 revolutions per minute for full power. Some modifications have been introduced in this engine, one of the most important being the utilization of lubricating oil for cooling the pistons, instead of fresh or salt water. Some designers are inclined to consider that this involves high lubricating oil consumption, but the makers state that this is not the case, and it admittedly has certain advantages. The bore and stroke of the engine are 24.8 inches and 51.2 inches, respectively, and, unlike most motors of this class, it drives a bilge pump and a sanitary pump, although all the remaining auxiliaries are electrically operated. The *Centaur* is, in fact, a good example of the application of electricity on motorships, and there are three generating plants of 150 brake horsepower each driven by four-stroke Diesel engines. The injection air compressors on the auxiliary machines supply sufficient surplus of air for maneuvering the main engines, and no electrically-driven compressor is fitted.

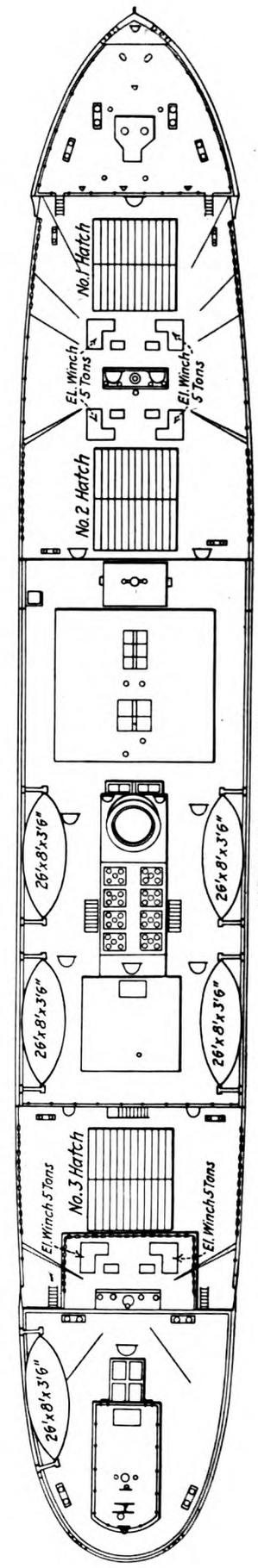
New Type of Electric Winch Installed

There has just been developed in England a new type of electric winch specially adapted for installation on motorships, and the first example of this machine is seen on the *Centaur*. Instead of driving the winch through mechanical gearing, as is ordinarily the case, the motor and winch are all carried on one bedplate with the armature shaft and the winch drum in line. The motor is of the series wound type, running at a speed of under 100 revolutions per minute, and the particular feature of the design is that the speed is automatically reduced as the load increases and vice versa, this being carried out electrically. The winches are employed in connection with the ordinary contactor house in which are located the various contactors, but it is stated that the cost is lower than that of the ordinary design, and that it is fool-proof. Moreover, it is stated to be lighter than the normal electric winch. As the high cost of electric winches is one of the reasons why they are not universally adopted on motorships, it is obviously a matter of importance to be able to cheapen them, and considerable interest has been shown in this new type of winch. It is manufactured by J. H. Wilson & Company of Birkenhead.

The daily fuel consumption of the *Centaur* for a speed of 12 knots when fully laden will be about 6 to 7 tons.

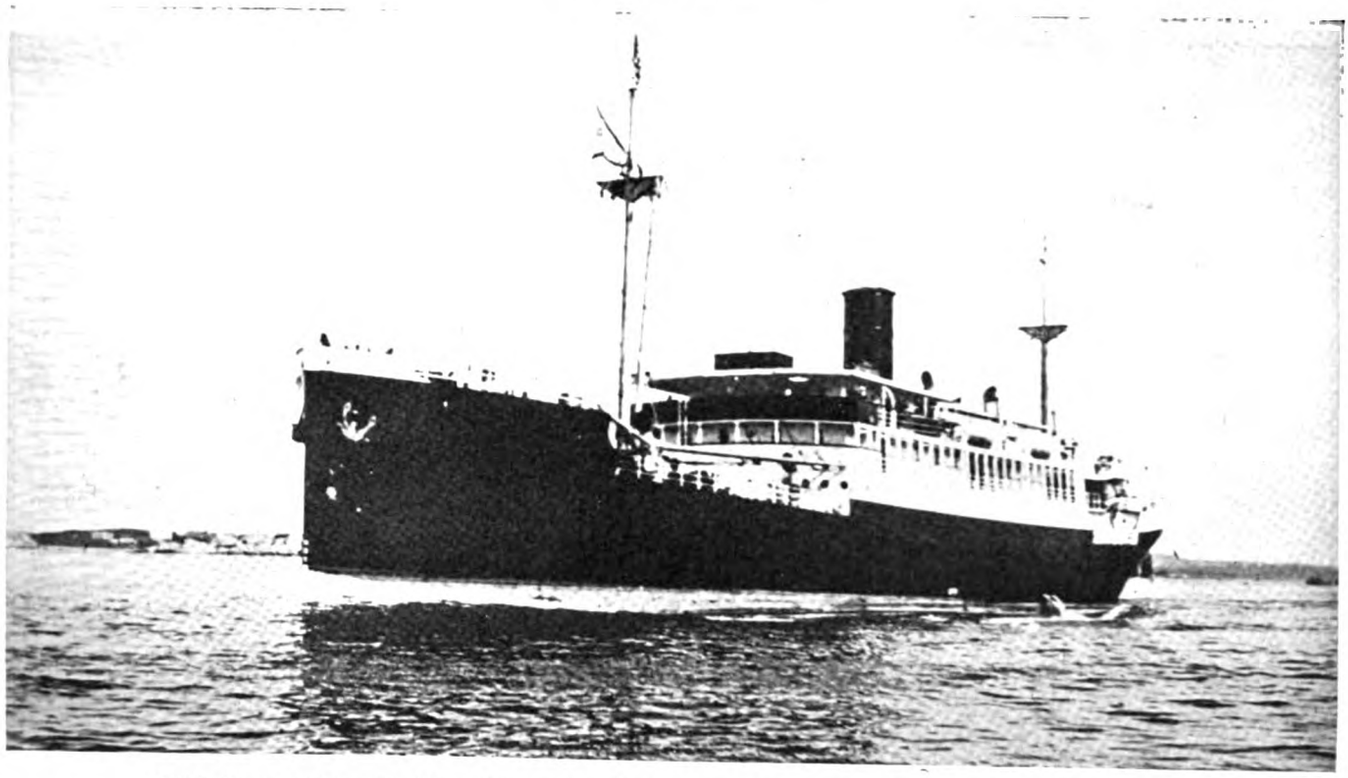
Generated on 2024-09-12 12:03 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN





General Arrangement Plans of the Motor Cargo and Passenger Ship City of San Francisco

Generated on 2024-09-12 12:03 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN



Twin Screw Motorship City of San Francisco for Service Between San Francisco and Panama

THE CITY OF SAN FRANCISCO

The *City of San Francisco,* which sailed from Gothenburg for San Francisco, through the Panama Canal after completion of trials in September, is another mixed cargo and passenger vessel of moderate dimensions. She is to be followed very shortly by the sister ship *City of Panama,* and both are to be operated by the Pacific Mail Steamship Company of San Francisco, between that port and Panama.

The general dimensions and particulars of the ship are as follows:

Length, overall	314 feet 6 inches
Length, between perpendiculars	300 feet 0 inches
Breadth, molded	45 feet 9 inches
Depth, to main deck	21 feet 6 inches
Height of 'tween decks	8 feet 6 inches
Draft, summer freeboard	20 feet 3 inches
Corresponding deadweight	3,160 tons
Total cargo capacity, grain	183,840 cubic feet
Total cargo capacity, bale	162,810 cubic feet
Total fuel oil	685 tons
Total water ballast	1,153 tons
Total lubricating oil	14 tons

Tanks Nos. 1, 2 and 3 of the double bottom, wing tank and deep tank may be used for either fuel oil or water.

The normal speed at sea will also be 12 knots, but the propelling plant in this case comprises two engines each of 1,300 indicated horsepower running at 130 revolutions per minute.

TWIN VS. SINGLE SCREW PROPULSION

In view of the similarity of the *Centaur* and *City of San Francisco* it may be asked what are the respective advantages of twin and single-screw propulsion. It would be very difficult to answer this question. It might be thought that the single-screw machinery would be lighter and cheaper, and the cost of upkeep less. Yet it is stated that with the development of the relatively fast-running engine for twin-screw plant, their weight and cost do not exceed those of a single engine of twice the power. Obviously, the two motors give an additional safeguard against any possible breakdown, but in view of the proved reliability of the oil engine, there is perhaps not much importance to be attached to this point.

GENERAL ARRANGEMENT OF THE CITY OF SAN FRANCISCO

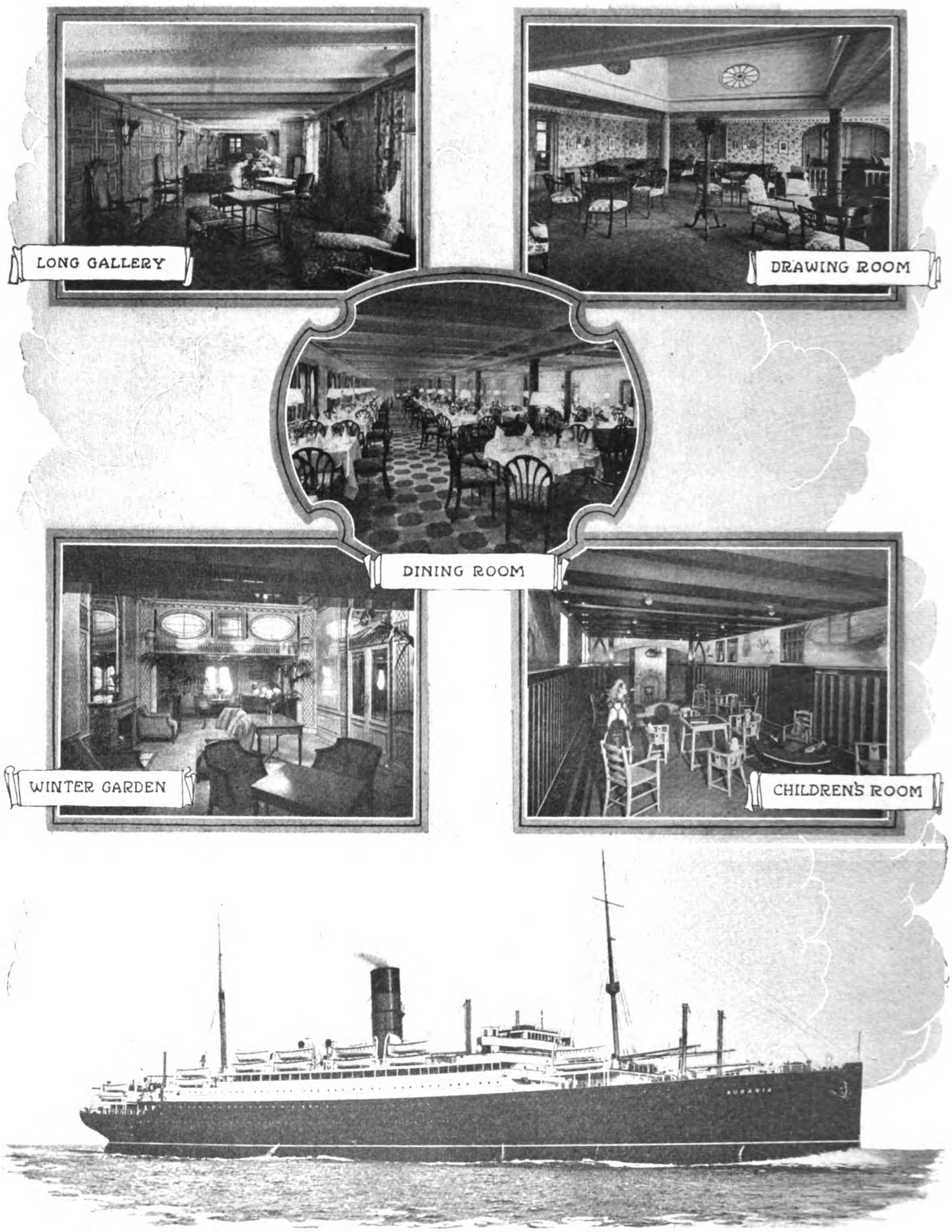
The first class passengers, deck officers and engineers are berthed in excellent cabins in a large deckhouse amidships. Most of the passenger cabins have four berths convertible into two-berth cabins, but there are a few de luxe cabins on the boat deck. In all, there is accommodation for 59 first class passengers, besides which 60 steerage passengers can be carried in large cabins at the after end of the vessel. The cargo capacity is about 3,150 tons in three holds, two forward and one aft of the engine room. It is somewhat interesting to note that all the fuel oil is not carried in double bottoms, but that a large deep tank is arranged at the forward end of the engine room.

The two engines, which were built by Götaverken, under Burmeister & Wain license, each develop 1,300 indicated horsepower in six cylinders, 23¼ inches bore and 35 7/16 inches stroke, the speed being 130 revolutions per minute. These are of standard design and need no description. The electric plant, which is on an extensive scale, is supplied from three generators, each driven by a 100 horsepower Diesel engine, but the accommodation is heated by steam which is also supplied to the galley. The public rooms for the passengers, in addition to the dining saloon, include a smoking room and a ladies' saloon besides a verandah café.

On trials, the speed of the vessel reached 12.76 knots, and it is stated that the fuel consumption, which was ascertained during the trials, worked out at 10 percent below the guarantee.

NAVAL ARCHITECT DIES.—Thomas Hammond Fulton, naval architect, and treasurer of Henry J. Gielow, Inc., 25 West 43rd Street, New York, died recently at his home on Staten Island, N. Y., at the age of 46 years. Mr. Fulton was a graduate of the City College of New York and Webb Institute of Naval Architecture.

Generated on 2024-09-12 12:04 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN



The New Cunard "Cabin Ship" Aurania Brings Within the Reach of All the Pleasures of Travel de Luxe

Generated on 2024-09-12 12:27 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Steamship Aurania Placed in New York Service

Fourteen Thousand-Ton Cabin and Third Class Liner Added to Cunard Fleet—New Vessel Is Luxuriously Fitted Out

THE newest Cunarder *Aurania,* built by the firm of Swan, Hunter and Wigham Richardson, Ltd., at the Tyne yard, is the eleventh steamship to be built by this firm to the order of the Cunard Steamship Company, Ltd. The *Aurania* is the last word in the development of cabin and third class passenger ships. She will be used in the Cunard services between Liverpool and the United States.

The *Aurania* has an overall length of 540 feet; beam, 65 feet; depth, 43 feet; tonnage, 14,000; speed, 15 knots, and will carry 520 cabin passengers and 1,042 third class passengers.

The accommodations have been carefully planned, so that the spacious public and private rooms insure every comfort to the traveler. The outstanding features in her accommodations include a winter garden, a long gallery, a gymnasium and a children's nursery. All the public rooms are intercommunicating and in close proximity to private suites. The smoking room is one of the finest rooms ever designed for a cabin liner. The scheme of decoration is Italian in effect.

Smoking Room of the Aurania

Propelling Machinery and Boilers

The propelling machinery consists of steam turbines of the Parsons type, driving twin screws through double reduction gearing. The main machinery consists of two sets of turbines and mechanical gearing generally in accordance with the latest practice for superheated steam and suitable for a working pressure of 220 pounds per square inch. The ahead propelling machinery of each set consists of one high pressure turbine driving, through a flexible coupling, one pinion and one low pressure turbine, driving through a flexible coupling the other pinion of the first reduction gearing and through the second reduction pinions to the gear wheel mounted on the main shaft. The astern propelling turbines are incorporated in the same casings as the low pressure ahead turbines. The total power for astern work is about 63 percent of the ahead power. The complete turbine installation can develop a collective shaft horsepower of about 8,500 with the revolutions of the propeller shafts at about 90 per minute. The high pressure turbine is designed for 3,190 revolutions per minute and the low pressure turbine for 2,170 revolutions.

The condensers are suspended from the under side of the low pressure turbines and each has a cooling surface of 4,250 square feet. The auxiliary machinery includes two circulating pumps of the centrifugal type each driven by a horizontal spindle steam turbine, one turbo driven and two direct acting feed pumps, two turbo water extractor pumps, and other fittings in connection with the Weir's closed feed system, three direct acting forced lubrication pumps, two ballast pumps, two bilge pumps, two 50-ton evaporators, two turbo generators, an auxiliary circulating pump and a small condensing and pumping plant for dealing with steam drains.

An auxiliary condenser with a cooling surface of about 1,000 square feet has been fitted up complete in the engine room. All the turbo driven auxiliary machinery is suitable for using superheated steam.

Steam is supplied by two double-ended and two single-ended cylindrical multitubular boilers arranged in one compartment in the ship. The boilers are arranged for burning oil-fuel, but provision is made for fitting coal burning furnace mountings.

The mean diameter of all the boilers is 17 feet 6 inches. The mean length of the two double-ended boilers is 22 feet 6 inches and of the two single-ended boilers 11 feet 6 inches. Each double-ended boiler has eight furnaces and each single-ended boiler four furnaces. The combined heating surface for the four boilers is about 19,900 square feet. The boilers are fitted with Robinson's type smoketube superheaters capable of supplying steam having a superheat of 200 degrees F. at the inlet to the high pressure turbine. The boilers are arranged to burn oil on the Wallsend-Howden low pressure system, with Howden's forced draft.

The oilburning installation is arranged in duplicate and consists of two transfer pumps and two complete sets of pumping and heating plant, one of the sets acting as a stand-by. Settling tanks of suitable capacity are provided in the cross bunker between the engine and boiler rooms. A complete workshop is also provided for the use of engineers.

Accommodations

In the accommodations for the cabin passengers, the *Aurania* is said to have a greater proportion of single and two-berth rooms than any liner of her size. In addition, there are a number of private suites consisting of bedroom, sitting room and bathroom, which constitute a novel feature for a liner of this class.

The third class passengers on the *Aurania* are accommodated in large and well appointed cabins and commodious public rooms. The dining saloon is large and airy and the special kitchens fitted with modern up-to-date devices, insure not only excellent cooking but also speed, service.

The present *Aurania* is the third steamer of that name to appear in the Cunard fleet. The original *Aurania* was built in 1883 and she was the first of the Cunard fleet to be fitted with suites of rooms, then known as "Parlor Staterooms". The second *Aurania*, when on her eighth voyage, was lost through enemy submarine action.

Generated on 2024-09-12 12:17 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

The Care of the Laid-Up Fleet

Program Adopted by the Shipping Board Reduces Cost of Maintaining Laid-Up Fleet and Improves Its Condition

By James Swan*

AS a result of the slump in shipping, which followed the period of feverish activity immediately after the war, the Shipping Board was faced with the problem of laying up and caring for an inactive fleet of unprecedented size. The problems presented were many of them new and there was little in past experience upon which to base an intelligent and economical program of action.

It was at once realized that in concentration lay the most obvious and reasonable possibility of an economical handling of the situation, but, although the assembling of the ships in a few large fleets was at once undertaken, other considerations, very possibly of a local and political nature, resulted in the laying up of some vessels in almost every port of importance, from Portland, Maine, to Seattle. Many of the ships were tied up at private piers, thus involving a very considerable expense for wharfage and other similar charges.

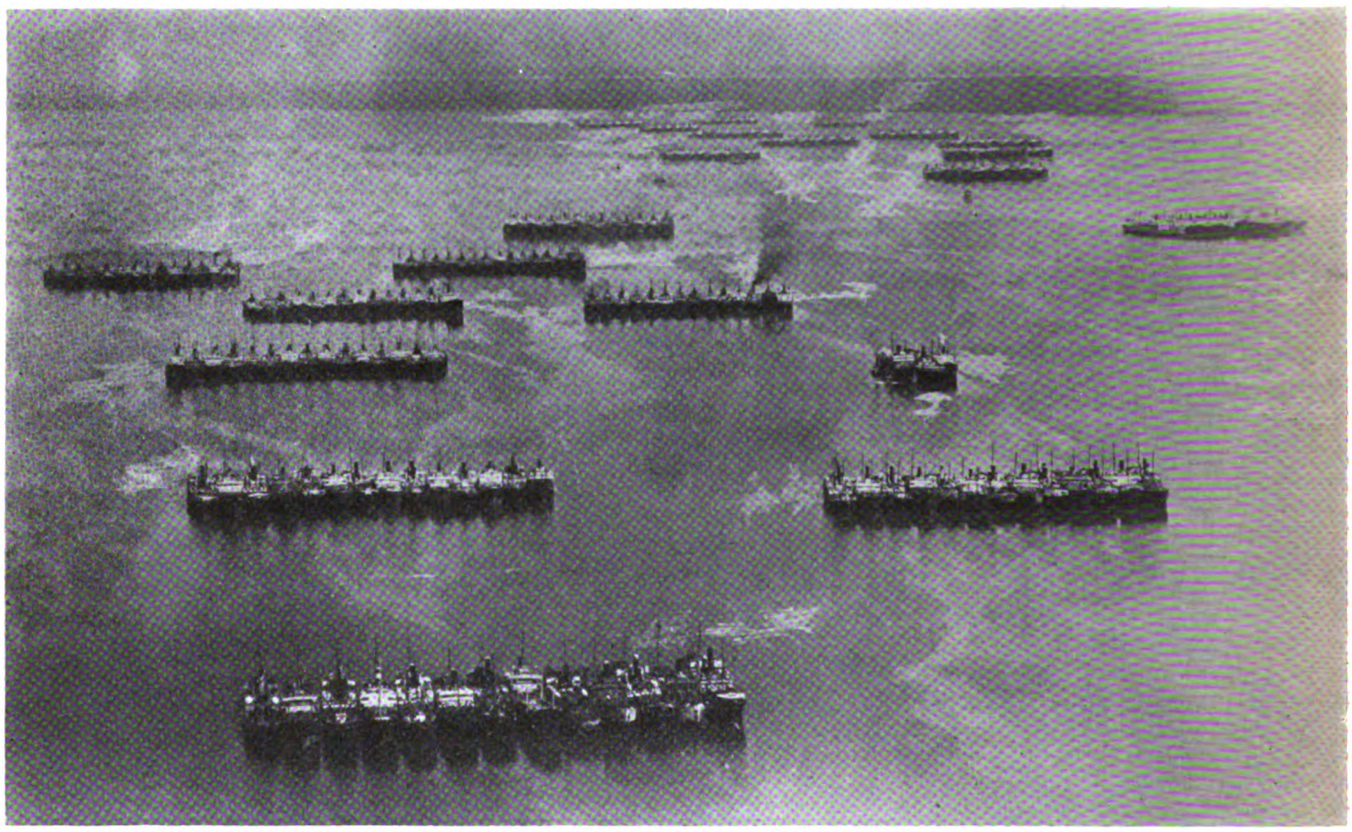
Owing largely to the efforts of Mr. J. E. Sheedy, the vice-president of the Fleet Corporation in charge of operations, concentration was proceeded with as rapidly as practicable and by March 1, 1923, the inactive ships were practically all laid up at one or the other of the following points: Portland, Maine; New London, Conn.; Jones' Point, N. Y. (Hudson river); Staten Island, N. Y.; Hog Island, Pa.; Baltimore, Md.; Camp Eustis, Va. (James river); Charleston, S. C.; Pensacola, Fla.; Mobile, Ala.; New Orleans, La.; Orange, Texas; San Francisco, Cal.; Portland, Ore.; and Seattle, Wash. The total number of vessels laid up was, at this time, approximately 900.

Committee Surveys Laid-Up Fleets

The necessity for making a survey of this mass of ships, in order that a basis for their commercial valuation might be established and also to ascertain, in as great detail as possible, their actual physical condition, led the Shipping Board, in March, 1923, to appoint a Central Fleet Survey Committee. This committee perfected a survey organization composed of shipbuilders, engineers and others whose experience rendered them competent ship or machinery surveyors. The survey was rigidly and systematically carried out so far as this was possible without docking each vessel, and steam testing her machinery, both of which processes were, under the circumstances, quite out of the question. The success of the survey was, in large part, due to the active and ready assistance of the laid-up fleet personnel, who, owing to their knowledge of the individual vessels were in a position to render material aid to the surveyors.

A large amount of information was obtained, tabulated and analyzed by the Survey Committee and its assistants.

With regard to the valuation of the ships, this article is



Shipping Board Vessels in the James River

* Editor of Marine Engineering and Shipping Age.

Generated on 2024-09-12 12:14 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

One of the Staten Island Fleets

not concerned. It was, in great part, office work; the survey results entering in as a factor in the final calculations.

HULLS IN BETTER CONDITION THAN MACHINERY

The physical condition of the ships was found, on the whole, to be good—better than the general public had been led to believe. Speaking broadly, the hulls were in better condition than the machinery, as, perhaps, was to be expected, for it must be remembered that much of the machinery was not of desirable design to start with, and that nearly all of it had suffered to a greater or less extent from careless and inefficient handling and operation.

It was found that while the ships were in fair condition they had arrived at a point, in many cases, where immediate steps were necessary to be taken, if the setting in of active deterioriation was to be prevented. Furthermore, as it had been impossible to examine the underwater portions of the hulls, it was recommended that a number of ships from each fleet be docked for this purpose. In general, such ships as had been withdrawn from lay up and dry docked before entering active service had been found to be in excellent condition but three which had been in lay up for a short period, and then docked, were known to have sustained very serious damage from chemical or electrolytic action. For this rea a further investigation along this line was deemed essential.

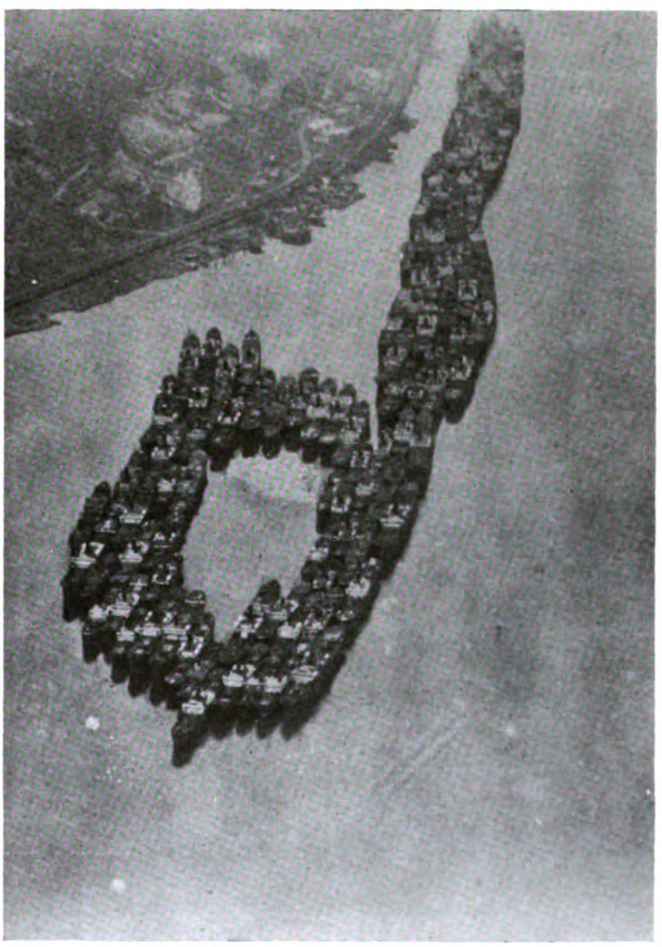
In January of this year, the care of the laid-up vessels was assigned to the Ship Sales Department of the Fleet Corporation, of which Mr. J. Harry Philbin, one of the trustees of the corporation, is manager.

MAINTENANCE PROGRAM ESTABLISHED

With the Central Fleet Survey Committee's report as a basis, an outline of procedure for caring for and maintaining the vessels was laid out and put into active operation. One of the first steps taken was to dock several ships for an examination of their bottom plating. Without exception this was found in good condition. It appears reasonable to assume that a majority of the remaining ships are in equally satisfactory shape, and that the fears entertained, as a result of the experience with the three ships previously mentioned, were, to all intents and purposes, practically groundless.

MACHINERY PROTECTED FROM CORROSION

The survey report clearly indicated that the two principal tasks involved in a general maintenance program were the scaling and painting of the hulls and the opening up and thorough protection, from rusting and corrosion, of the propelling machinery. The latter work has been actively proceeded with in all the fleets. Engines, turbines, auxiliary machinery and boilers have been opened up, packing rings removed and all surfaces properly coated or greased. The cylinder heads and upper turbine casings are raised and supported on sleeve bolts thus being constantly open for inspection and such further care as may be found necessary. The boilers are being thoroughly cleaned and scaled, the lagging removed and outside painted with red oxide paint and inside with white zinc and oil.



The Fleet at Jones' Point, Hudson River

SCALING AND PAINTING OF HULLS

The scaling and painting of an enormous fleet of ships is a work of such magnitude that to attempt it, for all of them, would involve an unwarrantable expense, particularly as a large proportion of the vessels could not be expected, under any ordinary circumstances, to ever be called into active operation. As one of the results of the survey the vessels had been classed on a basis of potential value as competitive or saleable units. Acting upon this classification and with the advice and

Generated on 2024-09-12 12:18 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

assistance of the operating department of the Fleet Corporation, the more valuable vessels, in themselves a large fleet, were selected for immediate attention.

It was realized that hand chipping, scaling and painting would, alone, be quite inadequate to meet the situation, while on the other hand, the fitting up of air compressors and similar plant on each group or unit of vessels would involve a very considerable expense and in many ways was impracticable.

The obvious method was to fit up one vessel with the necessary equipment and bring the other vessels to her, or take her to them, as was most convenient.

How the James River Fleet Is Cared For

Following this plan, the *Orion*, an ex-German steamer in the James river fleet, has been equipped with two second-hand air compressors, obtained at a low cost, and with all the necessary cleaning, scaling and paint spraying apparatus and quarters have been fitted up on board for the mechanics and laborers engaged in the work. Two ships are handled at a time, one on each side of the *Orion*, and the work of cleaning and painting is proceeding rapidly and efficiently. When it is stated that as much as 300 tons of ashes, stones and dirt, has had to be removed from one vessel before scaling and painting could be proceeded with, some idea is obtained of the magnitude of the task with which the laid-up fleet custodians are confronted. At present, the ninth and tenth ships to be completely cleaned and painted are alongside the *Orion*. The writer examined two ships upon which work had been completed and can say, without the slightest hesitation, that so far as preservation is concerned, they have been put in excellent condition.

No attempt is made to repair actual breakage or damage, but a most important part of the work is the tagging of all parts found to need repairs and the preparation of a complete list of all such work, to be turned over with the ship when she is taken out of the fleet. The value of this information to the future operator can scarcely be overestimated.

The cost of fitting up the *Orion*, as above described, has amounted to approximately $37,000 of which $9,000 is for compressors and other equipment which would be available for other uses, if the occasion arose. The reconditioning crew consists of 40 mechanics, engineers, etc., and 175 colored laborers in addition to the steward's crew.

The entire cost of operating the vessel, including wages, sustenance, coal, paint and all other material is in the neighborhood of $28,000 a month. At the present rate of work approximately 20 large vessels can be reconditioned per year making the cost per ship between $16,000 and $17,000. The first ships worked on were found in particularly bad condition and moreover the work is proceeding more smoothly and rapidly with each succeeding vessel. It is expected that over 30 ships per year will eventually be turned out, and the unit cost thus very materially reduced.

Methods Adopted on the Other Fleets

At Jones' Point, on the Hudson, a different procedure is followed. Here the ships are moored in one large fleet, and a compressor and other equipment is installed on a tug, which is moved from point to point, as required.

Owing to the severe climatic conditions obtaining at this location, the main effort has been directed, during the past summer, to the exteriors of the vessels, a large portion of which have been completely cleaned and painted. The holds have been cleaned and ceilings removed, interior scaling to be proceeded with during the coming winter. The machinery has been thoroughly cared for in the manner previously described. Although the entire work laid out has not been yet completed on any individual ship at Jones' Point, for the reasons given above, the average amount of work done per ship is greater in this fleet than in the others.

At Hog Island, the compressor plant is installed on a pier alongside of which four ships can be moored and worked on, all of them proceeded with simultaneously. For the Gulf fleets, the compressor plant is mounted on a barge and moved where needed. On the west coast fleets, which are of comparatively small size, portable compressor plants are being used.

Laid-Up Fleet Expenses Being Reduced

One of the most satisfactory features of the reconditioning work which we have described is that it is being accomplished coincidently with a reduction of total laid-up fleet expenses. On January 1, 1924, before the present system of maintenance was put in operation, the monthly total cost charged to the laid-up fleet was approximately $248,000. On September 30 this figure had become $230,000, notwithstanding the fact that included in it were the costs of operating the *Orion* and other similar plants, and a considerable amount of equipment for these plants.

This result has been obtained by concentration of effort and the confining of the greater part of the operations to potentially valuable vessels. In the James river, where the ships are moored in groups of from 12 to 16 vessels each, a mother ship, on which steam is maintained and having a regular crew is assigned only to the groups of more valuable vessels, the remainder, comprising about two-thirds of the total, being laid up "cold" with one day and two night watchmen for each group. To pump out and otherwise care for these cold vessels, two of the lake type steamers are being utilized as movable mother ships, going from group to group and pumping out as necessary, the crew, in the meantime, carrying out such work as they can handle, as cleaning and painting inner bottoms, etc. These mother ships remain alongside a group in cold lay up for about one month and then proceed to another, taking the whole fleet in rotation.

As we have often had occasion to remark, the final disposal of these vessels is a matter about which a great difference of opinion exists, but it is certainly satisfying to know that, whatever may be their final fate, the better ships are being well taken care of and that their value is actually being enhanced by the work done on them while at the same time the total cost of maintaining and caring for them is being steadily reduced.

Lake Freighter Has Novel Features

ON October 18 the freighter *Joseph H. Frantz*, of the Columbia Steamship Company, was launched at the River Rouge (Mich.) yards of the Great Lakes Engineering Works. The new vessel has several innovations in arrangement and equipment. She is 618 feet long over all, 62 feet molded breadth and 32 feet molded depth. The hull is constructed on the transverse system, with arch deck girders and 12-foot hatches, spaced 24-foot centers. She has a continuous double bottom and hopper side tanks throughout the cargo hold.

A feature entirely new is the slanting of the main deck stringer, or top of the side tanks, which allows the cargo to flow to the unloading machines without the necessity of shoveling the cargo from the top of the side tanks, as is usual in all other lake freighters. The pilot house is another peculiar feature, it being known as "winged" out on the sides, allowing the navigation officer an unobstructed vision of the bow and sides of the vessel, a point most captains are seeking to obtain, in order to have a clear view of the dock when making a landing without going outside of the pilot house.

The propelling machinery consists of a triple expansion engine, supplied with steam at 230 pounds per square inch by three Babcock and Wilcox watertube boilers.

Generated on 2024-09-12 12:03 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Elastic Towing*

Investigation of Deep Sea Towing—Model Experiments at Washington—Details of New Automatic Tension Towing Engine

By Spencer Miller†

IF towing hawsers were more elastic they could be smaller for the same service. An elastic hawser, in absorbing the inevitable shocks of towing in a heavy sea, automatically increases the space through which the hawser stress acts and consequently increases the time of application of this stress. A hawser of sufficient elasticity would, in effect, become an automatic speed regulator for both the towing and towed vessels in a seaway.

The wire rope hawsers of commerce are elastic, but their stretch, within the elastic limit, is rarely more than 2½ percent. The spring action of a 1,000-foot wire hawser may range from 10 to 25 feet but is entirely inadequate to materially reduce the stress when towing in a rough sea.

Manila hawsers are not truly elastic and have no elastic limit. When stretched to any degree a Manila hawser will not return to its original length after the stress is removed. Manila hawsers, towing with an ample factor of safety, yield and elongate generously to a surge and minimize the jerks, but, when they slacken, the recovery is only partial. These hawsers elongate about 12 per cent at one-third their ultimate strength.

An Experimental Spring Hawser

The writer experimented with a coil spring hawser about 20 feet long, composed of coil door springs, coupled end to end. With this hawser a small motor boat towed a 24-foot cat boat with the following results:

With both boats at rest and lying at right angles, the stern of the motor boat touching the bow of the cat boat, the former was started at full speed. The hawser stretched to about twice its length, the motor boat gradually slowed down, and the cat boat deliberately turned and followed. The distance between the boats then gradually decreased until the two went at the same speed. It is obvious that the motor boat exerted its full power in accelerating the tow and it is inconceivable that, with a non-elastic hawser, this acceleration could have been accomplished so quickly.

With both boats under way, the helm of the cat boat was put hard over, causing it to yaw and slow down. The hawser stretched out, the motor boat slowed down and when the cat boat straightened out, the distance between the boats returned to normal and the speed was equalized.

These experiments show that with an elastic hawser, when the towed boat slows down, the hawser lengthens and its tension increases, decelerating the tow boat and accelerating the tow. The necessity of spring action in towing hawsers is clearly indicated as well as the great advantage to be gained by the use of apparatus to provide this action immediately it is demanded.

Characteristics of a Super-Elastic Steel Hawser

Assume a steel hawser, 1,000 feet long with an elongation of 400 feet within its elastic limit and having an ultimate strength of 112,000 pounds, about the strength of a 1¼-inch diameter steel hawser. The elastic limit might be about 5/7 of the ultimate strength, or 80,000 pounds.

The following table shows the hawser stress with its corresponding elongation:

TABLE I

Hawser Stress, Pounds	Length of Hawser, Feet
0	1,000
10,000	1,050
20,000	1,100
30,000	1,150
40,000	1,200
50,000	1,250
60,000	1,300
70,000	1,350
80,000	1,400

The average hawser stress required to tow the U. S. S. *Maumee*, a 14,000-ton ship (without propellers), at 7 knots (12 feet per second) is about 20,000 pounds and it may readily be seen that the hawser indicated above would carry such a vessel through almost any seas with safety.

Suppose the towing boat to be of the same weight as the towed ship and that a wave strikes the latter with sufficient force to suddenly reduce its speed to 3 knots, or 5 feet per second. The speed of the tow thus becomes 5 feet per second less than that of the towing vessel. In 10 seconds the hawser would lengthen 50 feet and its stress increase 10,000 pounds, the tow being accelerated and the towing ship decelerated. Should the total stress become 80,000 pounds, the elastic limit would be reached, but the length of the hawser would have increased by 300 feet from normal. Thus the elasticity given to the hawser acts to absorb the shock of a wave striking the tow and consequently increases the time of application of this stress.

A tug boat, towing the same vessel, would be decelerated many times faster and the hawser would not require so much spring action or elasticity.

A Long Heavy Hawser With a Deep Sag a Common Method of Obtaining Spring Action

Seafaring men have long recognized the necessity of spring action in towing and have generally obtained it by the use of long, heavy hawsers, the sagging bight of which acts like an elastic spring. To further increase the spring action, it is common practice to attach the wire hawser to the bower chain, the addition of the chain multiplying the spring action by as much as three in certain cases.

The use of a long hawser is of further advantage in keeping the tow as far as possible out of the propeller wash of the towboat. This wash or counter current may have as much as 10 percent of the speed so that with the towing vessel making 10 knots, the hawser and its tow may be passing through water at 11 knots or even more. The propeller wash takes time to dissipate, so, as the towing speed increases, the hawser should be lengthened in order that the towed vessel may escape the extra resistance of the counter current and also to permit of more accurate steering.

The need of long towing hawsers is abundantly proved, both by experiment and actual service, as illustrated by the following examples:

(1) In a paper before the Society of Naval Architects

* This article is an abstract of a much longer paper by Mr. Miller, containing interesting notes on the friction of winches and towing machines and the strength of manila and wire hawsers which we expect to publish in a later issue.—The Editors.

† Chief Engineer, Lidgerwood Manufacturing Company, New York.

Generated on 2024-09-12 12:03 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

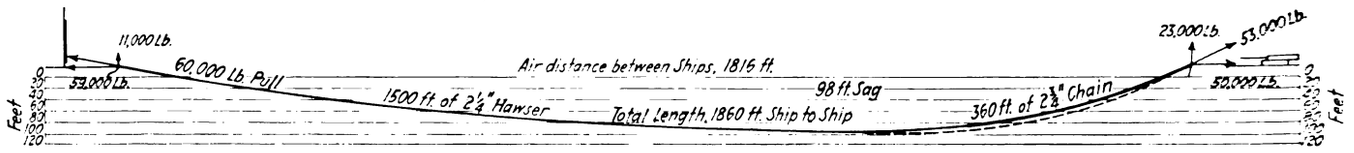


Fig. 1.—Catenary Curve of Hawser and Chain: Prometheus Towing Connecticut in Sea and Weather "Phenomenally Fine"

Weight of 2¼-inch diameter wire rope under water, 6.9 pounds; in air, 8 pounds. Weight of 2¾-inch chain under water, 65.3 pounds; in air, 75 pounds. Tension of hawser at stern of Prometheus, 60,000 pounds; speed, 9¼ knots. Resistance of hawser and chain at 9¼ knots, 9,000 pounds. I. H. P. loss with 40 percent propulsive efficiency, 635; with 35 percent propulsive efficiency, 728; with 30 percent propulsive efficiency, 848; with 25 percent propulsive efficiency, 1,015. This curve might be somewhat modified, as per dotted-line, on account of the great resistance it offers when towed 9¼ knots.

and Marine Engineers in 1912, Professor C. H. Peabody states that in experiments on the models *Fulton* and *Froude* it was found that a gain in speed of 10 percent was obtained by lengthening the hawser from twice the length of the towboat (60 feet) to six and one-half this length (195 feet).

Prometheus Towing Connecticut

(2) With the repair ship *Prometheus* towing the disabled battleship *Connecticut* at 9¼ knots, using a hawser over 1,800 feet in length, it was found that the extra resistance due to propeller wash was so great that steering the *Connecticut* to avoid the wake of the *Prometheus* resulted in "a probable 1/10 of a knot extra speed and an actual 5-pound drop of steam pressure at the *Prometheus'* high pressure receiver." A wire hawser 7¼ inches in circumference and 250 fathoms in length was shackled to the *Connecticut's* bower chain, 60 fathoms of the latter being paid out, thus making the total length of towing line 1,860 feet (see Fig. 1). The chain entered the water at an angle of 20 to 25 degrees with the horizontal, showing the heavy drag of the *Connecticut.* A dragging screw from a broken shaft added materially to the resistance of the latter vessel. The towline tension, as measured on the *Prometheus,* was 60,000 pounds when towing at a speed of approximately 9 knots in smooth water. The commanding officer of the *Connecticut* reported as follows: "No jerk or jar was felt on the *Connecticut,* the long scope of chain keeping a constant strain on the towlines, thus obviating the necessity of using the towing engine and thereby conserving steam for use essential to the main engines of the towing ship."

Fig. 1 shows a true catenary curve of the hawser and chain, towing at 9¼ knots, made from a model to correct scale. With 60,000 pounds pull, the sag of the hawser was 98 feet, and the resistance of the hawser and chain dragging diagonally through the propeller wash was 9,000 pounds, as determined from the U. S. Navy tests.

To translate this hawser drag into indicated horsepower involves a knowledge of the propulsive coefficient of the towing ship. Recent towing tests on the *Mississippi* indicate propulsive coefficients as low as 15 percent. The slip of the *Prometheus'* propeller, when towing the *Connecticut,* was recorded as 37.4 percent and it seems quite probable that the propulsive coefficient, in this case, did not exceed 30 percent; certainly it could not have been greater than 40 percent. Commander S. M. Robinson, U. S. N., of the Bureau of Engineering, estimates it at 35.45 percent. With a propulsive coefficient of 40 percent, the indicated horsepower loss due to hawser drag would be 635, and with 35 percent it would be 728.

Iroquois Towing Barge Navahoe

(3) Steamer *Iroquois* Towing Barge *Navahoe.* This interesting data, of unusual transatlantic towing is made available through the courtesy of the Anglo-American Oil Company.

The principal characteristics of the two vessels are as follows:

	Iroquois	*Navahoe*
Length	491 feet	466 feet
Beam	60 feet	58 feet
Normal draft	27 feet 4 inches	24 feet 7 inches
Freeboard amidships	8.8 feet	10.6 feet
Gross tonnage	9,201	7,180

Both vessels carried Chase Machine Company towing machines, having cylinders 18 inches by 20 inches and drums 50 inches in diameter by 6 feet long, designed to carry 3,000 feet of 2¼-inch diameter wire hawser. Each towing engine weighed 27 tons. Ford towing chucks were employed to lead the hawsers at the bow of the *Navahoe* and stern of the *Iroquois.* It was reported that in fair weather the automatic was rarely brought into play; in rough weather the range of payout of the towing machines was from 12 to 18 fathoms. In very rough weather the hawsers were paid out to 2,700 feet and the speed of towing was from 5 to 6 knots. It should be noted that the hawsers of both vessels were in use, the free end, in each case, being made fast to the other vessels.

Without attempting to estimate the actual resistances of the vessels and hawsers at a speed of 6 knots in a rough sea, Fig. 2 and Table II are offered as exhibiting the sag, tension, etc., of a 2,700-foot, 2¼-inch diameter hawser under various conditions. The curves were determined by a suspended chain model and resistances calculated from the Navy data obtained through the courtesy of Capt. J. C. Hunsaker, C. C., U. S. N.

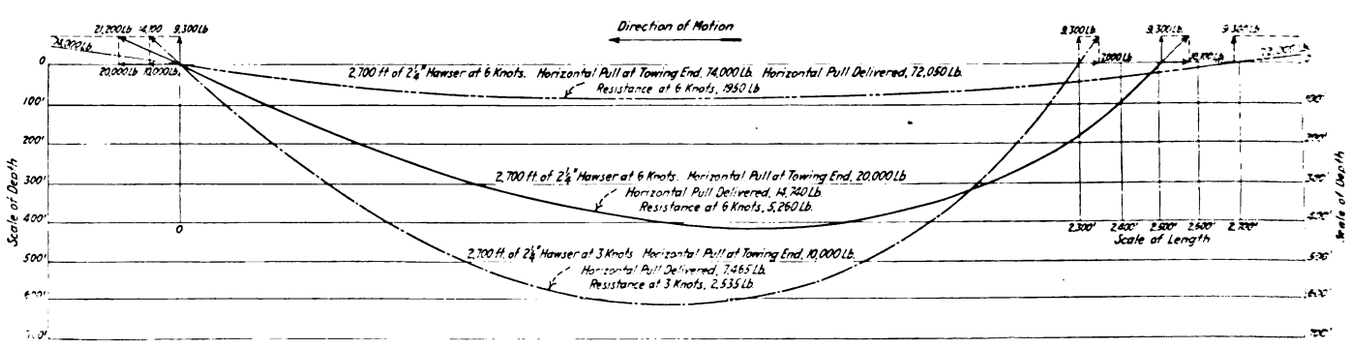

Direction of Motion
2,700 ft. of 2¼" Hawser at 6 Knots. Horizontal Pull at Towing End, 74,000 Lb. Horizontal Pull Delivered, 72,050 Lb.
Resistance at 6 Knots, 1950 Lb
2,700 ft. of 2¼" Hawser at 6 Knots. Horizontal Pull at Towing End, 20,000 Lb
Horizontal Pull Delivered, 14,740 Lb.
Resistance at 6 Knots, 5,260 Lb.
2,700 ft. of 2¼" Hawser at 3 Knots. Horizontal Pull at Towing End, 10,000 Lb.
Horizontal Pull Delivered, 7,465 Lb.
Resistance at 3 Knots, 2,535 Lb.
Scale of Depth
Scale of Length

Fig. 2.—Catenary Chart for 2¼-Inch Hawser, 2,700 Feet Long, at Different Stresses and Towing Speeds

Hawser 7-inch circumference, 2¼-inch diameter, weight above water, 8 pounds per foot; weight under water, 6.9 pounds per foot; ultimate strength, 342,000 pounds; working limit for safety of three, 74,000 pounds.

Generated on 2024-09-12 12:14 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Table II.—Sag, span and resistance of hawsers 2,700 feet long and 2¼ inches in diameter at 6 knots' speed. Weight per foot, under water, 6.9 pounds. Ultimate strength, each hawser, 342,000 pounds. Elastic limit, about 250,000 pounds. Two hawsers used.

Hawser pull by towboat, pounds	Tension in each hawser at towboat, pounds	Sag at lowest point, feet	Span-air line distance, feet	Difference, hawser and span, feet	Resistance* each hawser, pounds	Pull delivered, pounds
15,000	18,000	480	2,450	250	6,200	8,800
20,000	21,200	340	2,585	115	4,000	16,000
30,000	31,600	216	2,650	50	2,800	27,200
40,000	41,000	165	2,670	30	2,350	37,650
50,000	50,800	124	2,681	19	2,150	47,850
60,000	60,700	109	2,685	15	2,050	57,950
70,000	70,500	95	2,688	12	1,950	68,050
80,000	80,200	83	2,690	10	1,875	78,125
90,000	90,100	70	2,693	7	1,800	88,200
100,000	100,000	63	2,695	5	1,750	98,250

* Calculated from Navy Data.

It will be seen that with the *Iroquois* pulling 30,000 pounds, or 15,000 pounds on each hawser, the sag is 480 feet, the resistance per hawser 6,200 pounds, and the resulting loss, from the drag of the two hawsers, approximately 460 horsepower.

The Spring Action of the Hawser

The elastic range, or spring, is given in column 5 of the table. Taking a range from 15,000 pounds to 100,000 pounds stress in each hawser, it will be observed that the span varies from 250 feet to 5 feet less than the length of the hawsers. The spring action, due to sag, is, consequently, 245 feet, to which should be added 15 feet, the probable stretch of the hawsers, giving a total of 260 feet. Notwithstanding this extended elastic action, the hawsers are reported to last only about 14 months, during which period they elongate about 8 percent, indicating repeated straining above the elastic limit.

Battleship Towing Another Battleship

(4) A Battleship Towing Another Battleship. The U. S. Navy standard plan for towing gear for battleships under 22,000 tons displacement calls for two 2-inch diameter wire hawsers, type AA, 150 fathoms each shackled together and coupled to from 20 to 45 fathoms of two anchor chains. The towing ship has a sling around the after turret, the ends being coupled together and to the main hawser by shackles and link.

Fig. 3 is a catenary chart showing this combination of hawsers and chain while towing at a speed of 6 knots; 300 fathoms of hawser and 45 fathoms of chain giving a total tow line length of 2,070 feet. Towing in a rough sea, the hawser tension will vary several hundred percent. With a pull of 100,000 pounds, the hawser will form curve *C*, sagging 54 feet. With a pull of 20,000 pounds, curve *A* will be formed, the sag being 215 feet. The distance between the vessels varies 99 feet for these two conditions; adding 10 feet for hawser elongation gives a total spring action of 110 feet. This amount of spring is imperatively demanded when towing through rough seas but is only obtained by the use of the chain cable. Omitting the anchor chains and employing a steel hawser 2 inches in diameter and 2,070 feet long, the spring action as between 20,000 and 100,000-pound stresses would be about 40 feet. Therefore the use of the anchor chain as indicated increases the spring action nearly 300 percent over a plain hawser.

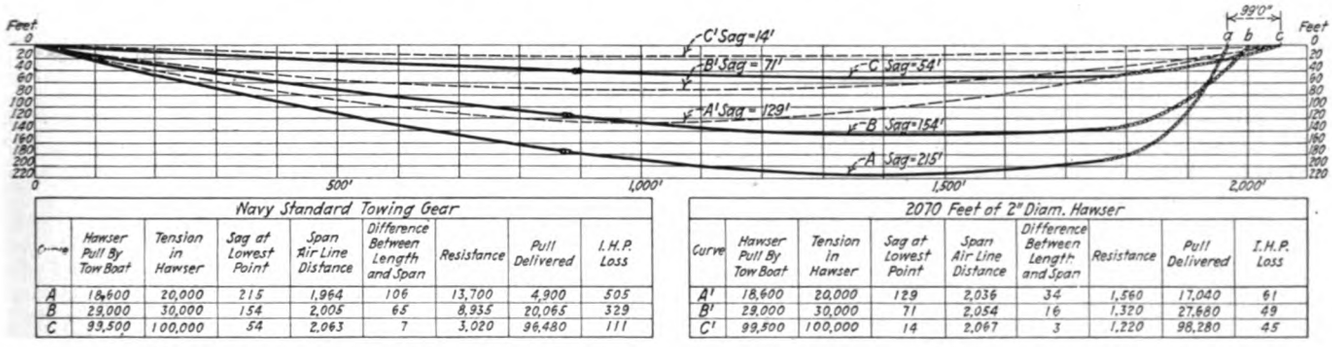
The resistance to towing this combination of hawser and chain cable at 6 knots has been calculated from the Navy data, already alluded to, with the following results:

Curve *C:* stress 100,000 pounds; resistance, 3,020 pounds; power loss, 111 I.H.P.

Curve *A:* stress 20,000 pounds; resistance, 13,700 pounds; power loss, 515 I.H.P.

Battleship New Hampshire Towing Battleship Connecticut

On August 26, 1920, the disabled battleship *Connecticut* was towed by the *New Hampshire,* using the combination of hawser and cable described in the preceding paragraph. It is understood that there was a strong northeast trade wind blowing. It required two hours to pass the hawser and get started. The speed of tow was worked up gradually to a maximum of 7.3 knots on the 28th. On arriving off Guantanamo at 2 P.M. of August 28, it became necessary to slow down and shorten both chains and hawsers to prevent their fouling the bottom in entering the harbor.



Navy Standard Towing Gear

Curve	Hawser Pull By Tow Boat	Tension in Hawser	Sag at Lowest Point	Span Air Line Distance	Difference Between Length and Span	Resistance	Pull Delivered	I.H.P. Loss
A	18,600	20,000	215	1,964	106	13,700	4,900	505
B	29,000	30,000	154	2,005	65	8,935	20,065	329
C	99,500	100,000	54	2,063	7	3,020	96,480	111

2070 Feet of 2" Diam. Hawser

Curve	Hawser Pull By Tow Boat	Tension in Hawser	Sag at Lowest Point	Span Air Line Distance	Difference Between Length and Span	Resistance	Pull Delivered	I.H.P. Loss
A'	18,600	20,000	129	2,036	34	1,560	17,040	61
B'	29,000	30,000	71	2,054	16	1,320	27,680	49
C'	99,500	100,000	14	2,067	3	1,220	98,280	45

Fig. 3.—Catenary Curve: Full Lines, Navy Standard Towing Gear; Dotted Lines, 2,070 Feet of 2-Inch Diameter Hawser; Speed, 6 Knots

Navy standard towing gear for battleships below 22,000 tons consists of one 2-inch diameter hawser, 300 fathoms long in two parts, and two 2¼-inch anchor chain, 45 fathoms long, shackled together. Rough sea speed, 3½ knots; smooth sea speed, 6 knots.

The difficulty of handling heavy towing gear under these conditions is emphasized by the following report of the *Connecticut's* commander: "This proved our undoing. In attempting it both ships lost their way through water completely. The wire hawsers could not be shortened in; unfortunately only the chain bridle being hoisted in, much time being consumed thus to no avail—the vessels drifted differently and—it was necessary for the *New Hampshire* to pull the *Connecticut* almost broadside through the water. This proved too much for the strength of the towing gear and one of the shackles connecting the wire hawser snapped —drifting as we thus were for 2.6 hours at the mercy of waves and current, the shore close aboard—was not restful to one's nervous system."

Towing Experiments at the Washington Experimental Model Basin

In 1921, the writer suggested to Admiral D. W. Taylor, C. C., U. S. N., the desirability of a better understanding of the towing resistance of heavy hawsers and the latter undertook an experimental investigation of the subject.

The experiments were carried out under the supervision of

Generated on 2024-09-12 12:02 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Capt. E. F. Eggert, C. C., U. S. N., at the experimental model basin in Washington. A model of the battleship *Michigan* was used, with full appendages, the port propeller removed, starboard propeller locked and rudder set 4 degrees to port, to simulate, as nearly as possible, the conditions of the towing of the *Connecticut* by the *Prometheus*, 3.6-inch diameter hawser substituted for the 2¼-inch. This resulted in an increase in tension of from 7,000 to 10,000 pounds in the range of 7 to 9 knots towing speed.

If a manila hawser of suitable size (5½ inches diameter) were substituted for the wire, its resistance, assuming that the weight of the chain was sufficient to submerge it to the

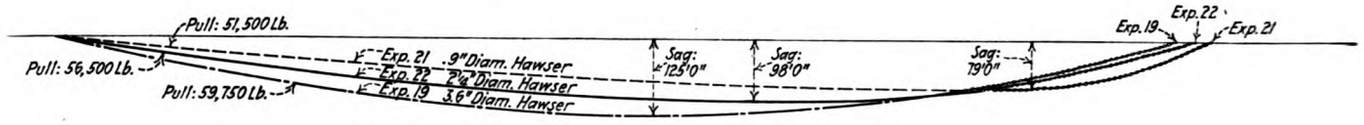


Fig. 4.—Catenary Curves of Hawser and Chain Under Water

Illustration of the curves for U. S. S. Michigan towed under various conditions.

previously described. The model hawser and chain corresponded to those actually used. (See Fig 4).

In Fig. 5 the upper curve, marked Exp. 22, gives the combined resistance of the hawser and *Michigan*. The resistance of the hawser was 7,000 pounds at 7 to 9 knots and 7,500 pounds at 10 knots. The tension was 39,500 pounds at 7 knots and 66,500 pounds at 10 knots. The sag was much greater at the lower stresses and offered relatively more resistance than at high stresses. As the speed increased, the sag decreased and exactly compensated for the added resistance due to increase in speed.

Again, the chart shows that the resistance of the *Michigan* alone, at 7 knots, was 32,500 pounds while for ship and

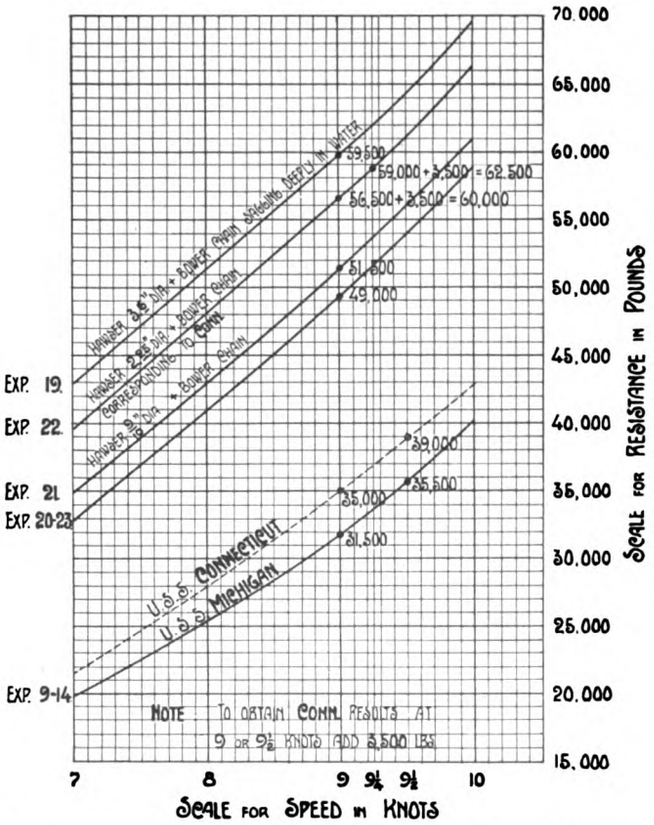


Fig. 5.—Resistance Curves Obtained by Towing Model of U. S. S. Michigan Under Various Conditions

hawser, at the same speed, a tension of 39,500 pounds was developed, the increase due to the hawser drag being 21.6 percent. If allowance is made for dragging the hawser diagonally and in the propeller wash, this loss will be materially increased.

In Experiment No. 19 the bower chain is retained and a same depth, would be in the neighborhood of 14,000 pounds.

The following table gives, in outline, the results of the model basin tests:

Table No. III.—Towing model of U. S. S. *Michigan* at various speeds with 2¼-inch hawser and bower chain. From test at Navy Yard, Washington, D. C., by Capt. E. F. Eggert.

Speed of towing, knots	Resistance, hawser out of water, pounds	Resistance, hawser in water, pounds	Resistance, of hawser, pounds	Percentage of added resistance	I. H. P. loss at 35.45 propulsive coefficient
7	32,500	39,500	7,000	21.6	418
8	40,750	47,750	7,000	17.2	479
9	49,500	56,500	7,000	14.1	538
9¼	51,500	58,500	7,000	13.6	553
9½	54,000	61,000	7,000	13.0	568
9¾	56,500	63,500	7,000	12.6	583
10	59,000	66,500	7,500	12.7	641

THE IDEAL TOWING EQUIPMENT SHOULD SUPPLY THE REQUISITE ELASTICITY TO PERMIT THE USE OF HAWSERS OF SMALL DIAMETER

The examples cited, as well as the universal experience of seafaring men, make clear the necessity of long hawsers in deep sea towing. They also show, with equal clearness, the difficulties attendant upon the use of the heavy hawsers and bower chain which have been found necessary in deep sea towing as at present practiced. Not only is this gear most difficult to handle, but the enormous sags which develop are prohibitive except well off shore, the hawser dragging on the bottom, losing much of its spring action and rapidly wearing out.

The ideal towing hawser should be long and slender, giving little sag as well as minimum resistance, but long slender hawsers do not, in themselves, have the requisite spring action so, if they are used, this must be supplied by some yielding and recovering mechanism, acting like a spring, and fixed to either terminal of the hawser.

DEVELOPMENT OF TOWING EQUIPMENT TO SUPPLY NEEDED ELASTICITY WITH SMALL DIAMETER HAWSERS—THE TOWING MACHINE

The function of a towing machine is twofold: (1) To provide power for lengthening and shortening the hawser, and (2) to add elasticity to the hawser.

The evolution of the hawser-spring reveals the accomplishment of less than a dozen men. In brief, it is as follows:

1853. Stephen F. Palmer of New York city patented a towing apparatus for canal boats consisting of a spring reel, about which the hawser was coiled.
1873. G. A. Olin's U. S. patent shows a drum to hold the hawser, but with no provision for its yielding.
1878. Scott and Gilmore, English wire rope manufacturers, suggested attaching the hawser to the drum of a steam winding engine so that the steam might cushion the shocks.
1880. Taylor (British) described a steam winch in which the towing drum was driven by a friction clutch, the drum slipping when the hawser was overhauled.

Generated on 2024-09-12 12:03 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

1885. McCarty (British) described a towing cylinder, filled with compressed air, with an automatically operated valve to increase the pressure as the hawser strain increased.

1888. T. Jackson Shaw and John M. Spiegle produced what was probably the first automatic steam towing machine and installed it on the S. S. *Orion*, belonging to the Boston Tow Boat Company. This marked the beginning of the development of steam towing machines in America and probably in the world. The Shaw & Spiegle machine consisted of a double cylinder, single drum, single gear winch of special construction with mechanism for operating a pressure controlling valve to increase the pressure as the tow-line was paid out.

1895. Frederick Metcalf, of the Chase Machine Company, made many important improvements in steam towing machines which are closely followed in many of the conventional towing machines on the market today.

1900. Mr. Metcalf's second patent, followed by a third in 1901.

1901. Mr. Metcalf, recognizing the enormous consumption of steam in recovering hawser previously paid out by wave action, provided mechanism to raise the steam pressure from normal to maximum in about 2/5 of a revolution of the drum thereby rapidly obtaining maximum resistance, losing less hawser and saving steam. Mr. Metcalf also recognized that commercial considerations prevented the sale of towing machines with drums large enough to permit the winding of the hawser upon them without severe bending stresses which tend to make the operation inefficient and rapidly crystallize and destroy the hawser, a further and potent illustration of the desirability of using small diameter hawsers.

THE AUTOMATIC TENSION TOWING ENGINE

It is only when towing machines are provided with means for yielding and recovering, similar to the action of springs, that the size of the hawser can be materially reduced. With an elastic range of 300 or 400 feet, the hawser tension should not vary more than 200 percent, and light hawsers are permissible.

In a paper on "Refueling Warships at Sea" (1914) the writer described an automatic tension engine, originally designed for coaling warships while towing at sea. In this machine, the winding drum is connected to its shaft by very heavy coil springs in such a way that it becomes a "feeler," responding instantly to variations of tension in its cable, whether winding in, paying out or standing still. Lever connections between the drum and a controlling valve *reduce* the steam pressure coincident with an increase in tension of the cable, thereby permitting the latter to yield and pay out without a serious increase in tension. Conversely, a decrease in tension is instantly followed by an increase in steam pressure, producing a pull on the hawser not much below the outhauling resistance. A practically constant tension is thus maintained—for example:

Winding in, 120 pounds steam pressure; pull, 16,000 pounds.
Paying out, 75 pounds steam pressure; pull, 17,000 to 22,000 pounds.
Normal tension (13-inch by 13-inch engine); pull, 18,000 pounds.

To fit the tension engine for towing, it was simply necessary to add another period to its cycle of operations; providing for the maintenance, as nearly as possible of a constant length of hawser. This has been accomplished by carrying the hawser drum on a rocking frame which moves slightly forward for an increase and backward for a decrease in hawser pull. The frame is restrained by heavy springs and coupled to the automatic controlling valve. The rocking movement of the drum is dampened by a mechanical dash-pot so that the engine remains stationary while the hawser pull varies from 3,000 to 6,000 pounds according to size.

The crank shaft is also geared to the valve increasing the pressure as the hawser is paid out and decreasing pressure as it is recovered.

The above combination produces a new towing cycle, as follows: When the hawser pull increases, the steam pressure falls; when the hawser slackens the steam pressure rises, as in the original tension engine.

When the engine is overhauled the hawser pays out with approximately 25 percent increase in pull, after which, owing to the operation of the valve-changing gear, the tension increases, while paying out, reaching a point possibly repre-

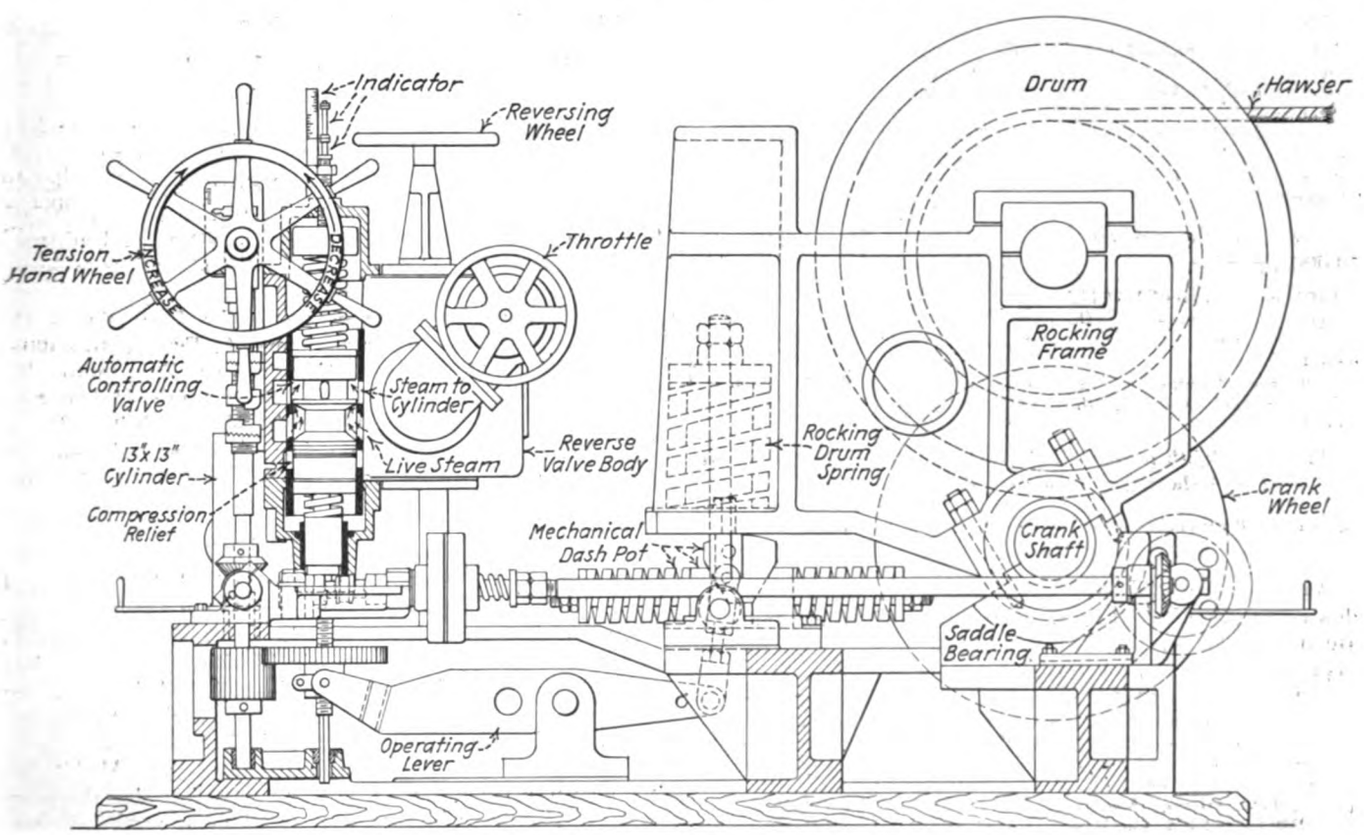


Fig. 6.—Automatic Tension Towing Engine

Generated on 2024-09-12 12:06 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

sented by another 25 percent, thus preventing an excessive loss of hawser from the drum.

When the hawser pull slackens and its tension is reduced 3,000 or 6,000 pounds, the steam pressure is instantly increased and the hawser wound in. While winding in, the steam pressure gradually drops, and the hawser previously paid out is entirely recovered.

Fig. 6 shows a 13-inch by 13-inch automatic tension towing engine, as described in the preceding paragraphs. The hand wheel serves to regulate the normal stress in the hawser. When turned in the direction marked "Increase" the steam pressure is gradually raised and the hawser tension increased, while reversing the direction reduces the normal hawser stress. When taking a vessel in tow, the hawser is first paid out, without steam on the towing engine. When a short length of hawser is thus paid out, the hand wheel is turned, increasing the steam pressure and building up the hawser stress. When a sufficient length has been paid out, the wheel is further turned in the direction of building up the stress, and stopped when the hawser is no longer paid out. When speed and length of hawser have been established; by throwing in a clutch, the valve changing gear is brought into action and the operation of the engine becomes automatic.

As previously explained, an increase of hawser pull instantly reduces the steam pressure. It is only after the steam pressure has been reduced that the drum begins to pay out its hawser and, by so doing, through the valve-changing gear, increases the steam pressure, increases the stress and prevents the loss of too much hawser. There is no conflict between the two automatic functions; in fact they cooperate and combine to produce the new towing cycle.

Operation of the New Towing Cycle

It is assumed that a 13-inch by 13-inch automatic towing engine has been overpowered and overhauled by a superior pull, after which the slackened hawser will be wound in.

The following is the sequence of events, the figures given being approximately correct:

First period (normal pull) 18,000 pounds; steam pressure 100 pounds.
Second period (hawser outpull) 22,000 pounds; steam pressure, 75 pounds.
Third period (hawser outpull) 25,000 pounds; steam pressure, 80 pounds.
Fourth period (hawser outpull) 28,000 pounds; steam pressure, 90 pounds.

Assuming the hawser to now slacken from 28,000 to 20,000 pounds:

Fifth period (inpull) 20,000 pounds; steam pressure, 150 pounds.
Sixth period (inpull) 17,500 pounds; steam pressure, 130 pounds.
Seventh period (inpull) 15,000 pounds; steam pressure, 110 pounds.
Eigth period (inpull) 13,500 pounds; steam pressure, 100 pounds.
Ninth period (normal pull) 18,000 pounds; steam pressure, 100 pounds.

After the eighth period, the hawser paid out will have been recovered and the tension again brought to normal.

Service Operation of the Automatic Tension Towing Engine

As illustrating the remarkable flexibility and efficiency of this engine in actual towing at sea, the following examples are of interest:

(1) Collier *Cyclops* towing battleship *Wyoming*, August, 1915. The *Wyoming* (26,000 tons) was towed at a speed of 4-1/3 knots, using only 100 fathoms of 1-inch diameter hawser, the hawser stress never exceeding 18,000 pounds. The total payout and recovery was about 30 feet and the hawser was out of water all the time.

(2) *Cyclops* towing destroyer *O'Brien*, September, 1915. The *O'Brien* (1,174 tons) was towed 9½ knots with the same 1-inch hawser. The test lasted 4 hours; winding in tension, 16,000 pounds; paying out tension, 17,000 to 22,000 pounds.

(3) Towing battle targets, Hampton Roads to Guantanamo, Cuba, December 28, 1916, to January 5, 1917. The *Cyclops* towed two targets, using the automatic tension machine; the *Kanawha* towed one, and the *Neptune* two, using ordinary methods. The three ships kept together, and all experienced heavy seas, day and night. The *Cyclops* experienced no difficulty, a constant hawser tension of about 16,000 pounds being maintained. The *Kanawha's* tow was lost on the way, to be recovered later and the *Neptune's* tow also failed.

(4) Towing battleship ex-*Massachusetts*, November 4-18, 1920. The ship was towed by the mine sweeper *Vireo* (1,400 I.H.P.) and the navy tug *Algorma* (2,000 I.H.P.). The *Vireo* led with a 1⅛-inch diameter steel hawser from her 13-inch by 13-inch automatic tension engine to the bow of the *Algorma*, 900 feet astern. The *Algorma* towed the battleship with a 2¼-inch hawser, about 1,800 feet long from her 18-inch by 18-inch towing engine, held by a powerful brake. The *Vireo's* hawser was gradually lengthened to 1,500 feet. The following incidents occurred during the 14-day tow:

In getting underway a misunderstanding of signals on the *Vireo* caused her to go ahead at 2/3 instead of 1/3 speed. There was only about 200 feet slack hawser, but when it came out of water, the tension engine paid out rapidly, there was no jerk and, as the steam pressure gradually raised, the *Vireo's* engines were brought to standard speed and paying out ceased.

On November 16, in a very heavy sea, the *Vireo's* steering gear was disabled and she went off into the trough of the sea 100 degrees off the course. As it was too rough to cast loose, the tow was kept going. The *Vireo* rolled very heavily, but the tension engine continued to function perfectly and, after the steering gear was repaired, the tow was brought back on its course. The sea continued heavy, the towing engine at times paying out 40 feet of hawser before reversing, in three or four surges, and then recovering it in the same way. There was about 1,500 feet of hawser between ships, and the wind and sea dead against the tow. The speed was reduced, the revolutions of the *Vireo's* engines being maintained at about 100.

November 17. Rough sea. The *Algorma* blew out a gasket and was obliged to shut down her main engines, whereupon the *Vireo* raised her steam pressure and towed both the *Algorma* and ex-*Massachusetts* at a speed of 3.3 knots. The sea was heavy enough to throw the tug's propeller out of water causing such violent vibration as to necessitate slowing down, but with steam on the main engines at its highest the hawser strain was recorded at 19,000 pounds and the tow was brought successfully into port on the 1⅛-inch hawser of the automatic tension towing engine.

Naval Architects' Society and Marine Association to Hold Banquets This Month

THE annual banquet of the Society of Naval Architects and Marine Engineers, which will be held at the Waldorf-Astoria, New York, Friday evening, November 14, promises to be an interesting affair. A number of prominent speakers have been invited to attend and address the Society and its guests. Practically all of them have already accepted this invitation.

Included in the list of speakers is the Hon. Curtis D. Wilbur, Secretary of the Navy; James A. Farrell, president of the United States Steel Corporation; Dr. James T. Shotwell, professor of economics at Columbia University; Major General Weizel, of the 12th Illinois United States Army, and Ira Campbell, prominent Admiralty lawyer of New York. The topics which will be selected by the speakers have not yet been announced.

Marine Association Dinner

The American Marine Association will hold its annual dinner at the Waldorf-Astoria on Wednesday evening, November 12. This dinner will be in the form of a grid-iron entertainment made famous in Washington. A number of speakers will address the members and their guests in a not too serious vein. Winthrop L. Marvin and Representative Sol Bloom will be the principal speakers.

A resolutions committee headed by Capt. C. A. McAllister has drawn up a set of resolutions covering the shipping views of the day which will be acted upon at the dinner. When finally adopted, it is intended that the resolutions shall be presented to the President of the United States.

Generated on 2024-09-12 12:04 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

How the Ravages of Corrosion Can Be Reduced

Bottom Plates of the Leviathan, Containing 1.67 Percent of Copper, Show Surprising Resistance to Corrosion—Where the Increased Cost of Copper-Bearing Steels Is Justified in Shipbuilding

By C. A. McAllister

IN a recent article the writer pointed out the serious financial losses to marine property, owing to the effects of primary chemical and electrolytic action. It seemed then impossible to form even an approximate estimate of how great these losses are. Since the first article appeared, however, there has gone the rounds of the daily press a statement issued by a bureau of research that the industrial losses throughout the United States, due to corrosion alone, amount annually to two and a half billion dollars. Comments as to the accuracy of this statement are withheld for reasons all too obvious. Such sums are beyond even the comprehension of the average mind. When it is reduced to a statement, that, on the basis given, the daily losses are seven millions of dollars, it approaches more nearly to an amount that can be comprehended. The proportion of it applicable to the losses on marine property are at least proportionate to the ratio which investments in marine property bear to the total investment in structures and appliances of ferrous metals for land purposes.

In any event, we will all agree that it is entirely too much, and that some means better than those at present in use should be forthcoming to stop some of this preventable waste. Such procedures as are now in use have for their objects a curtailment of the admittedly inevitable losses without striving to arrive at a cure.

Where Corrosion Is Most Prevalent in a Ship

The greatest corrosion in ship structures seems to take place in portions of the hull, which are immersed wholly or at intervals in salt water, the quite necessary medium in which most ships operate. The number of anti-fouling, anti-corrosive and other "antis" for preventing excessive rusting of these exposed portions of a ship's anatomy are legion. On the average it is deemed advisable to dry dock the average vessel once each six months.

Many people will remember the apprehension felt in marine circles regarding America's greatest ship, the *Leviathan*, then the German steamship *Vaterland*. At the outbreak of the war in the early part of August, 1914, this mammoth ship was tied up at the wharf in Hoboken, N. J., where she remained until the late spring of 1917, when the United States on entering the war had seized this vessel, together with many other German ships. The water in New York harbor, with all its sewage and acids, is very severe on ships' bottoms, hence, after lying for three years in port, without being dry-docked, it was quite natural to expect that the under-water portion of this vessel's hull would be found in a very bad condition.

Bottom Plating of the Leviathan Preserved by Copper in the Steel

To the surprise of all, the under-water-plating was found in fairly good condition, much better, in fact, than the most optimistic could have expected. The shipyard authorities, after the vessel was docked, took occasion to have a sample cut from one of the bottom plates analyzed, and much to their surprise found that the specimen contained 1.67 percent of copper, hence it is quite certain that the Germans had been using metal of this composition in 1912 when the *Vaterland* was constructed.

The strange thing about this disclosure is that "copper-bearing steel," as it is known in the trade, has been used in this country quite extensively for over ten years. While many of the largest steel mills have been manufacturing this product here, the marine fraternity, or the great majority of us, had known little or nothing about it. Ships, of all structures made by mankind, probably suffer most from corrosion, yet, so far as the writer can ascertain, this copper-bearing steel, designed particularly to reduce corrosion, has never been used in shipbuilding here, although today there is a small dredge being built at the Newport News shipyards, which will contain some of this material.

What the Steel Makers Say About It

We must have all been asleep, as the efficacy of copper-bearing steel has been conclusively demonstrated on land, and the cost is in no way prohibitive. A reliable steel mill asserts in a circular issued concerning this metal that "The original manufacturers claim an increase of nearly 500,000 tons on the tonnage sold last year over that distributed the first year."

Quoting further from this interesting circular, we find the following statements:

"Some investigators have proven that the *life of steel* under atmospheric corrosion will be more than doubled, and that under this condition copper-bearing steels are decidedly superior to pure iron, wrought iron or charcoal iron with negligible copper content.

"Unprotected iron or steel will develop a thin film of rust within a few minutes after being exposed to moisture and oxygen. This film is electro negative to the underlying metal and stimulates further corrosion. The physical characteristics and texture of this rust film are important factors in governing the rate of corrosion of the metal. This rust is limonite red in color, rough, loose and spongy in character. *When* rust forms on copper bearing steel it is of a very different nature. It is dark brown, closely adherent, and smooth and, if it does not really act as a protector to the underlying metal, it is at least much less an accelerator than is the rust on normal steel or iron.

"It was formerly claimed that the presence of copper in steel would seriously affect its physical properties. It is now known that the presence of as high as 0.50 percent copper in steel will have no effect on its physical properties.

"It has been claimed that copper-bearing steels do not weld satisfactorily. It is established that in the ordinary ranges there is no detriment in the physical properties of welds made with copper-bearing steels as compared with copper-free steels."

Copper-Bearing Steels Used Effectively in Car Building

The largest use of this material has been in plates for railroad cars, the usual copper contents being 0.20 percent to 0.35 percent. All the manufacturers seem to agree that the cost of copper-bearing steels is about $3 per ton more than for ordinary steel. Surely that cost should make it an attractive material for certain parts of ship construction in consideration of its much greater life.

It is well known that steel will rust in salt air much more rapidly than in places remote from the sea. Hence this rust-resisting material should fit into shipbuilding wherever light plates are used, whether they are subject to immersion in salt water or not.

In ship machinery, where steel and iron are used, they are generally so heavy, and so well covered with paint and lubricating oils, that corrosion is not so dangerous an ele-

Generated on 2024-09-12 12:03 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

ment. There are, however, certain parts of marine boilers where the losses due to corrosion are great, and at times dangerous.

Boiler Tubes a Vulnerable Point for Corrosion

Only recently one of the 535-foot Shipping Board steamers was compelled to return to port, after three days out, on account of abnormal use of fresh boiler water, due to the corrosion and pitting of her boiler tubes. In this particular ship the tubes were only four years in use, and serve as an object lesson in a field where a rust-deterring material would be most valuable for marine purposes. Many of us will recall that when lap-welded steel boiler tubes first came in use, owing to the scarcity of real charcoal iron, there were instances wherein boilers had to be entirely re-tubed after only six months of service. The seamless drawn tubes are of much better material, but even they are very vulnerable to the ravages of corrosion and electrolytic action.

Tube manufacturers advise me that if there is a demand for tubes made of copper-bearing steel, there would be no difficulty in drawing them either hot or cold. It would seem that this would be a very desirable matter of experimentation to determine the relative rust resistance of seamless drawn steel tubes of different amounts of copper content. The prevention of heavy scale on the tubes would be a very desirable matter, if we consider it solely from a heat transmission standpoint. All evidence seems to indicate that the use of a certain amount of copper in ordinary steel tends to reduce the thickness of the scale formation.

In these days of the keenest competition on the water, when shipowners are battling for their very existence, it would seem fitting for them to take heed regarding any subject, where, by a slightly increased initial cost of ship plates, and of boiler tubes particularly, future repair bills could be greatly reduced. Shipbuilders and naval architects should look after the interests of their clients by calling their attention to such methods as are herein described, whereby there seems little doubt that eventual savings may be made by incorporating some of this rust-deterring material in at least the vital parts of the structures.

Sewage Ejection

By W. E. Spofford*

A REVIEW of technical papers for some years past reveals little information on the subject of sewage ejection. This problem on steamships has become more acute with a growing tendency to build intermediate type liners with a higher standard of third class and crew accommodation.

The intermediate type liners have little freeboard due to their cargo carrying capacities which necessitates the locating of the overboard discharges from the toilets, galleys, etc., relatively high. As the third class and crew accommodations are necessarily below the first class, and as the Steamboat Inspection Service will not tolerate handpumps on the fixtures near the waterline, it has become necessary to adopt other means of ejection.

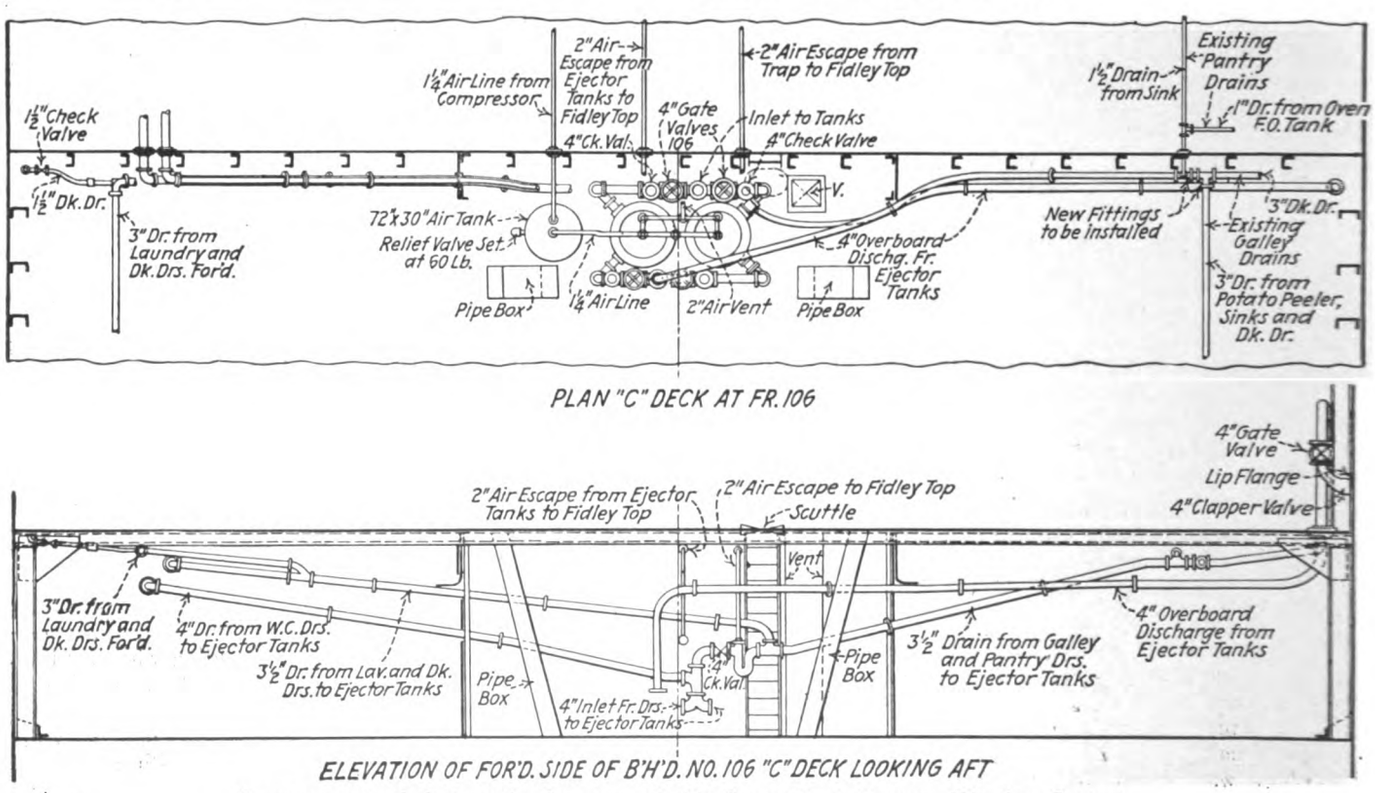
The system to be dealt with in this article is an automatic compressed air sump-tank system which has been installed successfully on several transatlantic and Pacific liners of the intermediate type. With this system the toilets, showers, deck drains and galley drains are brought down to main headers, usually on the port and starboard sides. These headers discharge directly into the sump tanks as is indicated on the sketch.

The tanks shown were located at a depth of 10 feet below the load waterline, and each tank was fitted with an automatic air-valve operated by a float within the tank and set to admit the air when the float was raised to the proper level by the filling of the tanks. Although the tanks are piped-up in parallel, each air valve operates as a separate unit.

The highest rate of economy is obtained as the amount of compressed air used is in proportion to the volume of liquid discharged. However, it has been found that, for ordinary purposes, 60 pounds of air is sufficient.

The air may be supplied from the ship's compressors or

*Chief of Design Department, Henry C. Grebe and Company, Inc., naval architects and marine engineers, Chicago, Ill.


1½" Check Valve
1½" Dk. Dr.
3" Dr. from Laundry and Dk. Drs. For'd.
1¼" Air Line from Compressor
2" Air Escape from Ejector Tanks to Fidley Top
4" Ck. Val.
4" Gate Valves 106
2" Air Escape from Trap to Fidley Top
Inlet to Tanks
4" Check Valve
72"x30" Air Tank
Relief Valve Set at 60 Lb.
Pipe Box
1¼" Air Line
2" Air Vent
Pipe Box
V.
4" Overboard Dischg. Fr. Ejector Tanks
1½" Drain from Sink
Existing Pantry Drains
1" Dr. from Oven F.O. Tank
New Fittings to be Installed
3" Dk. Dr.
Existing Galley Drains
3" Dr. from Potato Peeler, Sinks and Dk. Dr.
PLAN "C" DECK AT FR. 106
4" Gate Valve
Lip Flange
4" Clapper Valve
2" Air Escape from Ejector Tanks to Fidley Top
2" Air Escape to Fidley Top
Scuttle
Vent
3" Dr. from Laundry and Dk. Drs. For'd.
4" Dr. from W.C. Drs. to Ejector Tanks
3½" Dr. from Lav. and Dk. Drs. to Ejector Tanks
Pipe Box
4" Inlet Fr. Drs. to Ejector Tanks
Ck. Val.
Pipe Box
3½" Drain from Galley and Pantry Drs. to Ejector Tanks
4" Overboard Discharge from Ejector Tanks
ELEVATION OF FOR'D. SIDE OF B'H'D. NO. 106 "C" DECK LOOKING AFT

Arrangement of Automatic Compressed Air Sump-Tank Sewage Ejection System

Generated on 2024-09-12 12:17 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

from a separate unit. In the accompanying illustration the air was supplied from the ship's compressors, but in other cases, where the ship's equipment was already overloaded, a separate compressor unit was installed. In such a case the main compressors are hooked into the line as an emergency only. Where the separate compressor and air storage tank were used, an automatic governor was installed in the air line which controlled the compressor from the pressure in the tank. When the air is admitted to the sump tanks by the air valve, the tanks are blown out and the float drops, closing the air valve.

The sewage tanks are generally installed in pairs and, with the arrangement shown, are used separately or in parallel. The header from the deck drains and drains from lavatories and showers were trapped before connecting with the W. C. drains, and these traps were vented.

The overboard discharge from the sump tanks was fitted with a vertical loop. This line was also fitted with a lip-flange at the shell and check and gate valves near the shell in order that the line might be closed and repaired.

This system has two distinct advantages: Either air or steam may be used to blow out the tanks; and the galley drains may be run into the tanks without fear of stoppage by small debris of any nature.

Cam Profiles and Fuel Injection on Diesel Engines

By Major Johnstone-Taylor

THE British Admiralty have for some years past made numerous experiments on Diesel engines, having in their engineering laboratory several experimental engines. Upon one of these engines a comprehensive series of experiments was carried out to determine the effect of cam profiles. In communicating the results of these investigations to the Institution of Naval Architects Commander Beaman provides some interesting information.

It is, of course, generally appreciated that both the rate and manner of the fuel injection have a vital bearing upon the resultant combustion. Merely having a sprayer nozzle correct in all its details does not finally solve the problem—the regulation and timing of the flow through it are equally important. For instance, a cam of correct profile for one speed may prove entirely unsuited to another.

Experimental Apparatus

Designers and builders of Diesel engines can obtain a good deal of information upon this matter of cam profile by experiment, and the device used by the investigators referred to for obtaining valve lift diagrams is of interest. It is shown in Fig. 1 while a typical diagram is shown in Fig. 2.

An ordinary piston indicator *a* is mounted immediately over the top of fuel needle valve *b* which is actuated by the cam under examination. The end of indicator piston *c* is placed in contact with and actuated by projecting spindle *d* screwed into the end of the fuel needle valve. In order to obtain a conveniently long diagram for purposes of comparison a special pencil drum *e* is fitted over the ordinary drum which is driven through the medium of cord *f* from a crank or eccentric set at angle of 90 degrees to the main engine. The diagrams are taken while the engine is being barred round and the 90 degrees displacement of the indicator driving crank has the effect of opening out the critical period in the lift of the valve, thereby facilitating the comparison of one lift diagram with another. With these lift diagrams taken on tracing paper they may be superimposed and readily compared.

Detonation

Reverting to the remark that a fuel cam profile suited to slow speed would prove unsatisfactory at a higher speed, it was found that this was the direct cause of detonation. For instance, a cam was designed, which, giving a total fuel

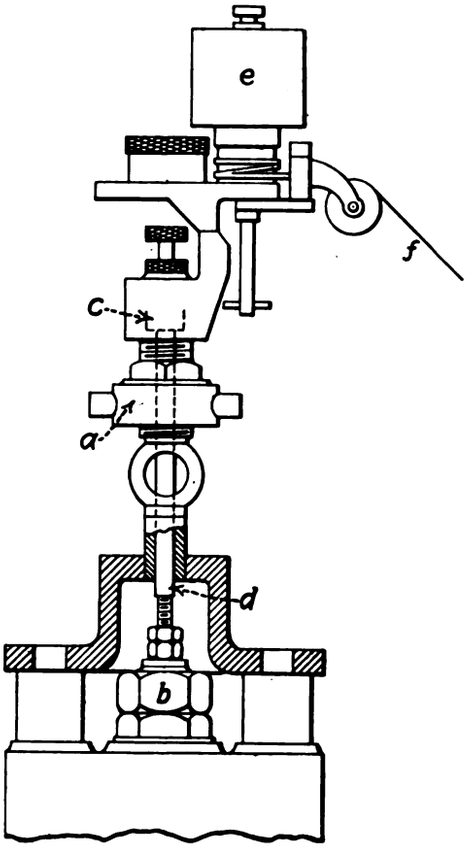


Fig. 1

valve lift period of 58 degrees of the crankshaft travel, proved entirely satisfactory when the engine (a single cylinder unit) was developing 285 brake horsepower at 285 revolutions per minute with a mean pressure of 159 pounds per square inch. Speeding up the engine to 390 revolutions per minute, detonation occurred which reduced the mean

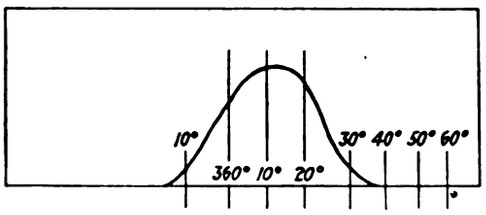


Fig. 2

pressure to 120 pounds per square inch. As no improvement was noted by any change in the sprayer, after several alterations had been made, a wider angle cam was fitted which improved matters.

Double Lift Cams

The best results were obtained with a cam whose diagram is shown in Fig. 3. It will be observed that this cam is of the double lift variety. The idea underlying this design is to inject the fuel in two stages, the first stage involving only the smaller portion of the fuel charge, which, becoming ignited on injection, would create a high temperature zone

Generated on 2024-09-12 12:04 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

for the reception and combustion of the following main fuel charge. No detonation resulted from the use of this cam when the engine was running at 390 revolutions per minute with a mean pressure of 130 pounds per square inch.

A brake horsepower of 333 was developed with a fuel consumption of 0.493 pound per brake horsepower hour. The

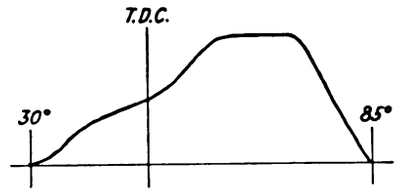


Fig. 3

ultimate solution of the detonation trouble with heavy fuel charges at high speeds was found in a long period fuel cam giving a comparatively gradual opening and closing of the fuel valve, a diagram being given in Fig. 4 from which

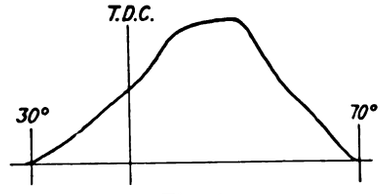


Fig. 4

it will be observed that the total fuel period is 100 degrees of crank travel, representing at 390 revolutions per minute 0.042 seconds.

These investigations, which are reported at some length, serve to show that fuel cam profile is an important matter, and as its investigation, by means of diagrams obtained as outlined, is a comparatively simple procedure, it would seem that troubles due to improperly designed cams could be easily avoided and a further step reached in reducing fuel consumption.

What Is the True Cost of Furnace Failure?

By I. S. Pieters*

WHAT does marine furnace repair cost include? How can the saving resulting from longer life through the use of more expensive furnace lining be evaluated? It is only when the cost of each item is evaluated and all factors are taken into consideration that the repair cost, hence the true significance of furnace life, is shown up at its true value. Incidentally, they show that the cost of the refractory is the least important item of cost, and that the cost of repairs is much higher than at first appears.

The total cost is made up of so many indirect costs that many of these are usually overlooked. Yet they have far-reaching consequences; and they materially increase the actual repair cost. These major costs are:

Labor for tearing out old brickwork and putting in new.

Cost of material, including interest on capital sunk in spare tile and brick, special shapes in stock and space they occupy.

Fixed charges on furnace, boiler and auxiliary equipment out of service while furnace repairs are being made, during which time they earn no return on the investment.

Loss of steam-making capacity—often a very serious matter when the ship is bucking a fifty-mile gale.

Lower over-all efficiency of the ship because other, and perhaps less economical, units must be worked harder and more inefficiently due to sustained overloads, forced fires that remain uncleaned or tubes that cannot be blown, all contributing to higher fuel consumption and ultimately higher maintenance cost.

Intangible expense that cannot be approximated due to contingencies. Higher combustion rates with boilers remaining in service to take the place of the dismantled units necessitate thicker fuel beds, higher draft, more severe furnace conditions. Clinker may form, the slice bar is called into more frequent use and the wear and tear of the furnace brickwork will be more severe. Many a furnace has had to be rebuilt later because of excessive service during emergency. Higher combustion rates may mean oil or the scale may assume serious proportions by causing tube failures. Here is another item of expense that rightfully should be charged to the cost of furnace maintenance.

Cost of fuel as represented by waste of heat in the furnace and boiler contents in taking the furnace and boiler out of service for repairs. To this must be added the cost of fuel needed to bring up steam again when repairs are completed. These are small items on a small boiler, but are bigger items on bigger boilers, where they may mount to many tons of coal in the course of a year.

There are other lesser expenses, but the above are the chief items of cost. The one thing they emphasize is that taking a furnace and boiler out of service and repairing the furnace is a very real expense. It may be a calamity; and it is always more costly than at first might be supposed because of the possible after effects. In addition to these there is the continual patching and repairing of a brick here and there which takes time, necessitates killing fires, wasting fuel and sacrificing steam-making capacity. Because this state of affairs is accepted as a matter of routine in no way lessens the expense.

The Limitations of Brick

One of the major causes of trouble is on account of bricks having different densities. The more dense bricks expand more than the bricks that are less dense. They crack more readily and cannot withstand wide and sudden fluctuations of temperature so well as less dense bricks. As they expand they push themselves one way or the other according to the least resistance or the influence of other bricks upon them. They gradually work loose as the fire clay melts and runs out, creating cracks and voids in themselves and between themselves and other bricks. The wall loses its solidity. The protruding ends spawl and melt under the exposure to the heat and erosion of the gases. Clinker and flue gas dust readily adhere to these protruding corners and serve to hasten the destruction of the entire brickwork.

All bricks cannot have the same density, whether made by hand or by machine, as the materials used, the rate and temperature of baking and the pressure used in forming the brick are all factors that tend to give each brick and each batch of bricks an individual density as well as coefficient of expansion. At best, uniformity is only relative. All bricks do not run true to shape, thus introducing another troublesome element that cannot be avoided. Still another factor is the skill and care of the bricklayers laying the brick, for they use varying pressure and amount of clay—a condition that can probably never be eliminated so long as brick is used.

It doesn't take long for bricks to be pried loose under the attack of the slice bar, where clinker adheres to them, or under the forces of expansion and compression. Careful laying of the brick, careful cementing and the use of the smallest possible amount of the right sort of fire clay all help. But these can never change fundamental conditions. They merely lessen their consequences.

Many steamship operators are eliminating the faults of fire brick lining by using monolithic one-piece linings—the linings that have no joints.

With a monolithic lining the density of the lining is the same everywhere. It is pounded in by mallet that pounds the plastic material to the desired resiliency; any laborer can install it. When smoothed with a trowel and vitrified by the first heat of the furnace, there are no individual

*Jointless Fire Brick Company, 1153 Clay street, Chicago, Ill.

Generated on 2024-09-12 12:17 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

bricks or sections to work loose and fall out. There are no joints to open up. There is no fire clay to flux and run out. There is no source of weakness. There are no corners or edges to become exposed to heat, to spawl. There are no voids or channels to allow cold air to seep into them to

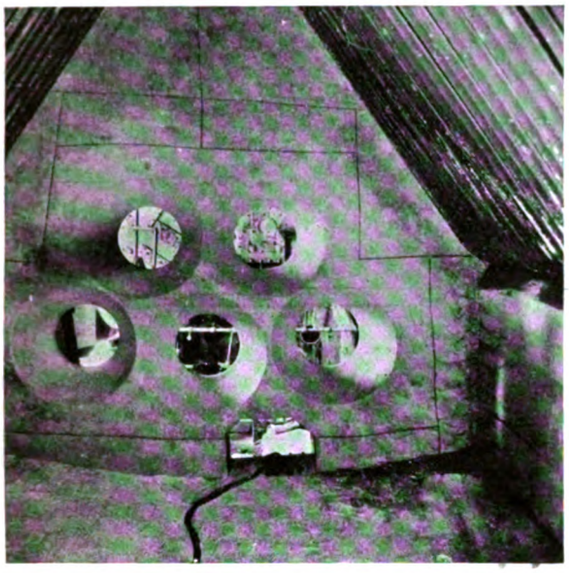


Fig. 1.—Monolithic Lining Applied to Oil Fired Watertube Boiler

waste fuel and work havoc with the brickwork, should a positive pressure build up in the furnace as may so easily happen, especially where forced draft is used. When the furnace pressure is negative, air infiltration will not take place because a monolithic lining is jointless. The inside is sealed; there is no incoming cold air entering to cool the

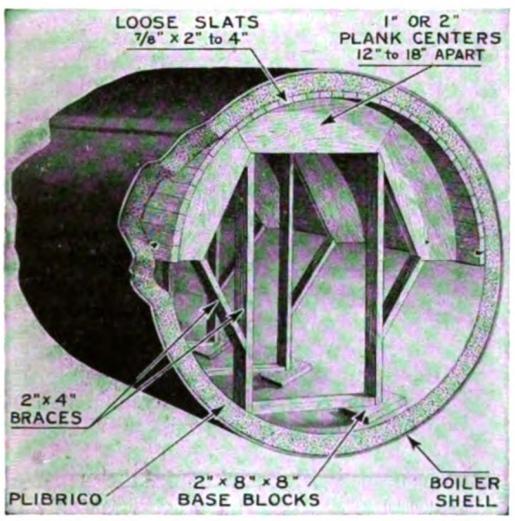


Fig. 2.—Method of Applying Monolithic Lining to Circular Furnace

brickwork and create local expansion and contraction at the source of leakage and so injure the brickwork and lower combustion efficiency. Less heat escapes from the furnace—coal is saved and the stoke hold kept cooler.

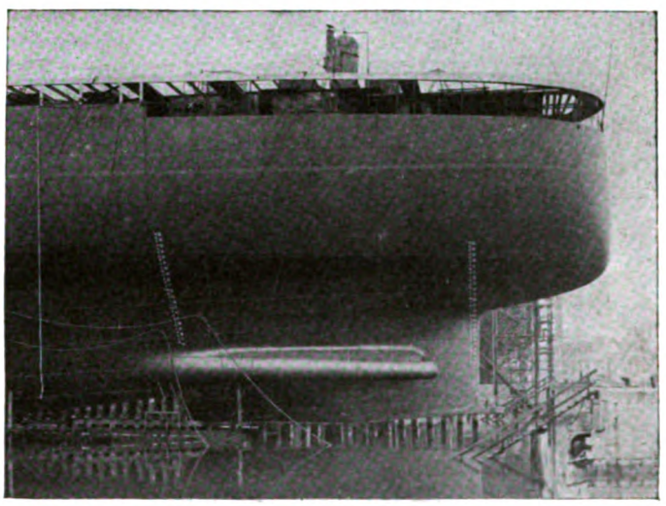
Monolithic linings are ideal for marine furnaces. Fig. 1 shows a completed Plibrico furnace lining. The cone-shaped holes for oil burners are used. Monolithic lining is especially valuable where odd shapes are used, because it can be pounded to conform to any special shape. It would have been a big job to have cut fire brick for the oil burner settings shown in the illustration.

The suitability of monolithic linings for special shapes makes it valuable for use in lining circular furnaces in Scotch marine boilers. How this is done with Plibrico furnace lining is shown in Fig. 2. A patent for the method has been applied for by the Jointless Fire Brick Company.

The lower half of the lining up to a little above the center will require no support. When gravity can no longer hold the refractory, a form is made as shown by the illustration. This form is made the necessary distance from the upper wall to insure the right thickness. The slats used can be 7/8 inch and put in firmly 12 to 18 inches apart. The lower slats are nailed, but as the work proceeds upward the slats are simply placed on the framework and the monolithic material pounded in behind; as it nears the top, the material will have to be shoved in and pounded into the small remaining space to complete the circular lining.

Holland-America Liner Statendam Launched

THE Holland-America liner *Statendam*, of approximately 30,000 gross tons, was successfully launched on September 11 by Harland and Wolf, Limited, at Belfast, Ireland. The new vessel, which is 697 feet by 81 feet by 53 feet 6 inches, is classed 100 A1 at Lloyd's, and



Stern of the Statendam

will have accommodation for about 3,000 passengers. Eleven watertight bulkheads divide the hull into 12 compartments and the double-bottom, which extends right fore and aft, is arranged for oil fuel or water ballast, and also fresh water, in six sections.

The first class dining saloon and reception room are on the saloon deck amidships. The smoking room is on the upper promenade deck with the verandah just abaft, while the first class social hall on the same deck has a large dome over the center extending to a height of 20 feet. The other first class accommodation includes the library, reading and writing room, and a palm court with a large dome overhead.

The second class accommodation is on an equal scale, while the third class and crew's accommodation is thoroughly up to date in every respect.

The propelling machinery consists of two sets of Brown-Curtis single reduction geared turbines. The electrical installation will be one of the largest installed on board ship.

Generated on 2024-09-12 12:03 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Portable Type Tester for Analyzing Flue Gases

AN instrument in convenient form for analyzing flue gases for carbon dioxide is being marketed in this country by Kelvin & Wilfrid O. White Company, 112 State street, Boston, Mass., under the name of the ECO_2-NOMETER CO_2 tester. The instrument is of metal construction and consists of a pump with a calibrated piston rod on which is engraved the CO_2 percentage scale, a rotary valve and absorbing chambers charged with dry absorbents.

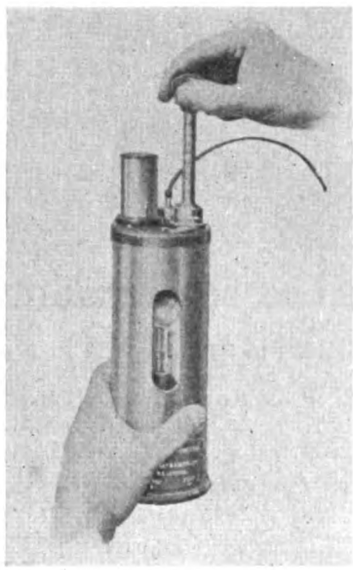


Fig. 1.—Portable CO_2 Tester

Its size is such that it will fit in a pint size thermos flask case, the device itself being only 3¼ inches diameter and 10½ inches long. In the hands of an ordinarily careful observer it is claimed that the instrument will give results to within ¼ of 1 percent of the carbon dioxide content of flue gas. The process of analysis is conducted under conditions of constant temperature and pressure. The instrument is shielded from the effect of changes of temperature of the surrounding air by a cork liner which surrounds the apparatus and by a sealed water jacket within which all the working parts

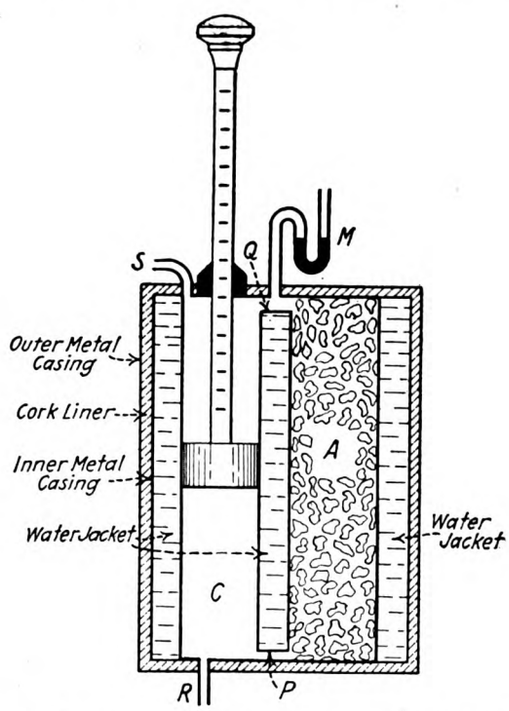


Fig. 2.—Diagrammatic Arrangement of Portable Tester

are contained. The pressure of the gases within the apparatus during the test is maintained approximately equal to that of the external atmosphere.

Fig. 2 shows the arrangement of the apparatus in diagrammatic form without the rotary valve. *C* represents the cylinder into which the charge of gas to be analyzed is drawn. *A* represents the absorbing chamber which is put into communication with the cylinder by the channels *P-Q* as required. *R* is the pipe connection through which a charge of gas is drawn into the cylinder, such charge passing on its way through a drying chamber, not shown. Connections *P-Q-R* and *S* are closed as required by a rotary cock seated valve. A manometer is represented in diagrammatic form by *M*.

In use a representative sample of the gas is drawn into the analyzing chamber of the ECO_2NOMETER. The rotary valve is then set so that the sample may be circulated through the absorbing chamber by moving the piston up and down. After the circulating process is completed, the piston is left in its topmost position. The pressure indicated on the manometer will be found to have fallen. In order to re-establish the original manometer pressure the piston is slowly pushed down until the gage indicates the equalization of pressure. The volume of the piston rod introduced into the system represents the carbon dioxide absorbed. This rod is graded with a percentage scale so that the reading on this scale when the manometer pressure has been re-established is a direct reading of the percentage of carbon dioxide in the gas under analysis.

Six Tank Ships to Have Double-Acting Diesel Engines

By Our Special London Correspondent

THE order which has been placed by the Anglo-Saxon Petroleum Company, London, with Dutch yards for six motor tank ships, each of 10,000 tons deadweight capacity, has aroused much interest in shipping and shipbuilding circles in Europe, particularly in Great Britain, where it was hoped the contracts would be given. From the engineering standpoint, however, the vessels are specially noteworthy as in each of them double-acting machinery is to be fitted. These will be of the Werkspoor four-cycle type, and the motors will be similar to the experimental set which was described in this magazine some time ago.

There will be six cylinders for each engine, 32¼ inches bore and 59.1 inches stroke, the power being about 3,500 brake horsepower or 4,500 indicated horsepower at 85 to 90 revolutions per minute. This will give the tankers a loaded speed of 12¼ knots. They are to be 440 feet between perpendiculars with a beam of 59 feet and a molded depth of 32 feet 9 inches. Three of the ships will be built by the Netherland Shipbuilding Company and the remaining three by the Rotterdam Dry Dock Company. Werkspoor of Amsterdam will supply three of the engines, while the North Eastern Marine Engineering Company of Newcastle on Tyne will build two under license and the Rotterdam Dry Dock one.

Some modifications will be made in the new engine as compared with the experimental unit which was referred to above. Chief among these is the employment of an arrangement which will enable only one hole to be bored in the cylinder cover at the top with the object of preventing the formation of cracks which sometimes arise between the holes for the reception of exhaust, inlet, fuel and starting air valves. In order to carry out this idea, the same valves will be used for inlet and exhaust, with a secondary changeover valve allowing this function to be performed.

The six vessels will probably be completed within 18 months or two years, and it is understood that four further orders for similar craft are about to be placed. It represents the biggest contract for double-acting machinery that has yet been given.

Generated on 2024-09-12 12:22 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Practical Diesel Engineering—V

Maneuvering the Ship—Routine Under Way—Securing — Engine Room Stores — Purchasing Fuel and Lubricating Oils—Precautions in Handling Fuel Oil

By Louis R. Ford*

IN maneuvering the ship, if the starting air pressure has been lowered appreciably by the engine trials, the auxiliary compressor should be started. This usually requires that an additional generator be cut in. The maintenance of the starting air supply is very important. The men in the engine room rarely know under what condition the ship is being maneuvered and should, therefore, always proceed on the assumption that a large number of engine starts will be required. If for any unforeseen reason ignition should fail to occur in the cylinders when the ship is in a dangerous position, it should be possible to keep the engines turning on air long enough to move it out of danger.

On some ships in which the auxiliary compressor is electric motor driven a very useful device is found in the form of an automatic electric starter which controls the compressor without attention from the engineers. It is simply a relay which is actuated by a switch operated by the air pressure gage. The switch is set for any desired maximum and minimum pressures. When the pressure falls to the minimum the gage pointer makes a contact which closes the relay circuit and starts the compressor, and when the pressure rises to the maximum the circuit is opened, stopping the compressor.

Maneuvering the Ship

Some engines will use a much larger volume of air than others when starting, depending on the design of the starting gear, but, subject to this limitation imposed by design, conservation of the air supply is largely dependent upon the skill of the man operating the engine. With a warm engine not more than two revolutions on air should be required before ignition of fuel occurs. If it is kept turning on air longer than this, it means a waste of air.

In order to reduce the power required to turn the engine, and thus reduce the amount of air used, all Diesel engines are fitted with some form of compression release gear which automatically vents all cylinders before the starting air enters, thus relieving the compression. In case of reversal of direction of motion this venting prevents any piston that has started a down stroke from being resisted by compressed air above it when it starts back in the other direction. In cases where the compression release is effected by a spring loaded valve operated by the starting air, as in a well known German design, this venting action always immediately preceded admission of starting air to the cylinders. If, however, compression release is obtained by any form of wedging device attached to the valve push rods so as to force the exhaust valves open when the push rods are pulled away from the cam shaft, just before the cam shaft moves to its new position, compression may occur again before the starting air enters. With this type when a reverse signal is received while the engine is running the reverse gear operates to pull the push rods away from the cams, translate the cam shaft and push the rods back into running position against the cams, all after the fuel has been cut off by means of the operating levers. While these events are occurring the inertia of the flywheel and propeller will be sufficient to keep the engine turning, so that when the valve gear is in position for starting in the new direction and the compression release gear is out of action the engine is still turning slowly, and before it stops compression will have occurred again in some of the cylinders. When the engine does stop this compression causes it to roll back in the other direction for a part of a revolution and sometimes oscillate back and forth several times before coming to a dead stop. A skillful operator can take advantage of this and, by watching the flywheel or some other moving part, admit starting air just at the instant the first oscillation in the reverse direction begins and the compression will assist the starting air to accelerate the moving parts, thus reducing the amount of starting air required.

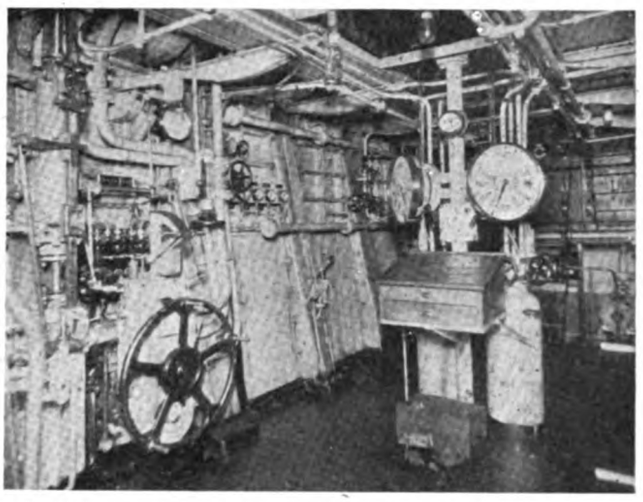


Fig 18.—Operating Station in Motorship Engine Room

During long continued periods of maneuvering some judgment must be exercised in operating the independent cooling water pump. If a considerable period of time elapses between successive starts of the engine, the pump should not be kept running long enough to cool the cylinders too much. The proper manipulation of the cooling water is best learned from experience with each particular installation but the guiding principle should be to keep the cylinders, heads and pistons hot enough to assist ignition as long as there is any prospect of immediate maneuvers, but not to allow the heat to become great enough to risk settling out of scale from the cooling water or causing the pistons to seize.

It is the practice on some ships, especially when operating on heavy fuel oil, to use a very light fuel oil or kerosene for starting the engines and when maneuvering. When this practice is followed a tank for light fuel is provided, with pipe and valve connection to the fuel measuring pump suction line. Near the conclusion of a run, just before entering port, this light fuel is turned into the measuring pumps and the engine operated on it until shut down. This insures the fuel system being filled with it, and there will be no heavy oil in the system to cause trouble when starting again.

The maximum capacity of the spray air compressor at-

* Consulting Diesel Engineer, 17 Battery Place, New York.

Generated on 2024-09-12 12:05 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

tached to each engine is always considerably in excess of that required for supplying spray air to the engine at full speed. The amount of air delivered by this compressor is regulated by throttling the suction or bleeding off part of the air from the first stage. When maneuvering the engine advantage of this excess capacity may be taken to assist in renewing the starting air supply. The compressor is adjusted for maximum capacity and the excess air above that required for spraying the fuel into the cylinders is bypassed to the starting air tanks. In some cases it may be found desirable to open wide the compressor unloader or throttle the suction for minimum capacity before starting the engine, so that the load on the engine at the instant of starting will be reduced, then adjust for maximum capacity after the engine is started.

After the ship is in the fairway and the last "full speed ahead" signal has been rung up the engine is worked up to normal operating speed, lubricators adjusted, cooling water adjusted until the desired running temperatures are obtained, starting air compressor is secured, extra generating set secured and sea routine is started. The operating station in a typical motorship engine room is shown in Fig. 18.

Routine Under Way

Under normal conditions at sea with the Diesel engine there is very little to be done except keep the eyes and ears open. By observing a regular routine of inspection of the main engines and all auxiliaries minor troubles may be caught in time to prevent them from developing into more serious ones. Normally there are certain conditions that must be maintained in order to insure good performance on the part of the engines. These conditions have to do principally with the spray air, fuel oil, cooling water and lubricating oil.

The gages on the low, intermediate and high-pressure stages of the air compressor give a pretty accurate indication of compressor conditions. Any variation from the normal working pressure in any stage should be investigated at once and its cause located.

Gages on fuel oil service tanks should be watched to see that the oil supply to the measuring pumps is maintained. It is customary to make these tanks of such size that each one holds enough oil for about twelve hours' running, so it is not necessary to pump up oil more often than every third watch. The vent cocks on the fuel measuring pump lines should be opened occasionally to vent any air that may have accumulated.

In addition to observing the pressure in the cooling water system regular readings should be taken from the thermometers in the various lines and the control valves regulated to maintain even temperatures in all the jackets.

Regular inspections of cylinder head valves and valve operating gear are very important. Sometimes an exhaust valve stem that is just beginning to stick may be loosened up by squirting kerosene around it. If the valves are of the type that have projecting stems that can be reached with a wrench, the valves should be turned occasionally. Cam rollers and other small parts are usually dependent on hand lubrication and should be oiled at regular intervals.

Most engines with forced feed bearing lubrication have enclosed housings, and there is little that can be done in the way of feeling crank, crosshead and main bearings, but the thermometers on the lubricating oil lines should be watched for any sudden rise in temperature that would indicate a hot bearing. After experience has determined the minimum number of drops of cylinder oil per minute required for correct cylinder lubrication the mechanical oilers should be regularly inspected to see that they are feeding just the right amount—no more, no less.

The form of engine room log used varies on different ships, but whatever form of record is kept the entries should be made at least every hour. This hourly collection of data for the log should be included in the routine of inspection of the various parts. While the details of the watch routine must necessarily vary with different types of engines some of the things that are included in a typical routine are as follows:

At Least Once Each Hour:

(a) Turn all spray and exhaust valve stems at least one-half turn to prevent sticking.
(b) Examine all cam rollers and see that they are free to turn.
(c) Open vent cocks on top of cylinder heads and air compressors to vent air from jacket spaces. This is particularly necessary when reciprocating water pumps with shifting valves are used.
(d) Feel air starting pipes close to cylinder heads. Abnormal heating indicates leaky starting valves.
(e) Read all thermometers and gages and record readings.
(f) Examine cylinder head joints and air line joints for leaks.
(g) Open handhole doors in housing, look for smoke and listen for knocks.
(h) Examine mechanical lubricators and time their feed.
(i) Blow water out of spray air bottles.

Once Each Watch:

(a) Clean fuel and lubricating oil strainers.
(b) Pump bilges.
(c) Sound and record readings of all oil tanks.
(d) Wipe down engines and clean engine room thoroughly.

Once Each Day:

(a) Take set of indicator cards.
(b) Filter one batch of lubricating oil.
(c) Record fuel and lubricating oil consumption.

Of course, this routine may be added to or varied to suit individual ships, but, regardless of the type of engines or ship, the supervision of the machinery while running should be as systematic as it is possible to make it. Systematic operation and orderly conditions in the engine room are pretty sure guarantees of success in Diesel engineering.

Securing

After arrival in port in a motorship securing is pretty simple compared with steamship procedure. When the signal "finished with engines" is received the stop valves on the spray air flasks and in the air lines to the spray valves are closed. Starting air tanks are pumped up to full pressure and the stop valves closed, fuel oil service tanks are pumped full and stop valves closed and lubricating oil pump shut down. The cooling water pump should be kept running at least fifteen minutes after the engines are stopped in order to absorb the heat stored in the metal of cylinders and pistons. After the bilges are pumped only the necessary port auxiliaries are left running and the routine port examination and overhaul may be proceeded with.

Engine Room Stores

Before arrival in port the chief engineer will have prepared a list of such stores as may be required, and the procurement of these stores is one of the first things attended to. The amount and nature of the articles requisitioned will be determined by circumstances, principally the location of the port. Some articles that are urgently needed must be purchased wherever the ship may be but routine replenishment of the stores stock is usually deferred until arrival in the ship's home port.

Fuel oil and lubricating oil are the items that need most frequent replenishment. There is a wide variation in the price of both of these oils in various ports, and advantage of this fact should be taken by filling the tanks whenever a call at a cheap port is made. As an example, fuel oil is cheaper at the present time on the Pacific Coast of the United States than anywhere else in the world, and motorships trading to Pacific Coast ports or making voyage stops there usually fill up with fuel oil, unless deadweight conditions, due to cargo carried, prevent.

It is obviously impractical to make up a standard stores

Generated on 2024-09-12 12:27 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

list that will suit all ships. The amount and nature of the stores carried will depend on the type of ship, nature of service engaged in, the ideas of the chief engineer and the policy of the owners. We can, however, outline in a general way the nature of the principal articles required and mention some of the work the requirements of which will exercise an influence in making up the list.

A new vessel will ordinarily be completely supplied with all the necessary engine room stores before starting the maiden voyage, and subsequent requisitions will cover only replacement of used material or addition of such articles as may be found by experience to be necessary or desirable. The following is a list of the principal supplies required, specifying the nature but not the amount of each, with some explanatory comments on certain items:

OILS AND PAINTS

Fuel oil.
Lubricating oil.
Lubricating grease.
Kerosene.
Gasoline.
Red lead, dry, for making joints and painting.
Litharge, dry, for making joints.
Shellac, for making joints.
Linseed oil.
Turpentine.
Colors, as required for general painting.
Prussian blue, for use in fitting bearings.
Portland cement.

PACKING

Special packings as may be required for such engine parts as spray valves, cylinder heads, fuel pumps, etc.
Braided flax, water packing.
Steam and water packing to suit the various glands on pumps and other auxiliaries.
Sheet fiber.
Sheet leather.
Sheet rubber.
Cotton wicking.
Asbestos rope.
Wool wicking, for oil drip cups.

TOOLS

Special wrenches and tools supplied with the machinery by the builders may usually be added to by various additional special tools that experience in overhaul work shows to be aids to quick assembly and removal of parts.
Hand hammers.
Sledge hammers.
Open end, box and crowfoot wrenches.
Soft hammers or sledges.
Monkey wrenches.
Stillson wrenches.
Machinist's scrapers, for fitting bearings.
Micrometer calipers, 2-inch, for measuring leads.
Inside and outside calipers.
Combination square.
Breast drills, one hand, one electric.
Bolt taps and dies.
Pipe taps and dies.
Tinners shears.
Blow torch.
Soldering iron.
Hacksaw, with blades.
Screwdrivers.
Oil stone.
Files.
Cold chisels.
Drills, for power drill press.
Lathe tools.
Grinding wheels.
Surface gage.
Micrometer indicator, for setting valves.
C-clamps.
Beam clamps.
Eye bolts.
Chain hoists.
Blacksmith's forge.
Punches.
Gage glass cutter.
Hydrometer, Baumé, for testing fuel oil.

METALS

Small bar stock, steel, brass, cast iron.
Sheet lead.
Sheet copper.
Sheet iron and tin for shims. A set of laminated shims will be found useful in making up various thicknesses.
Lead wire, for taking bearing clearances.
Wire gauze.
Bar solder.

MISCELLANEOUS

Assorted bolts and nuts.
Assorted screws.
Assorted washers.
Assorted pipe fittings.
Assorted rivets.
Cotter pins.
Emery cloth.
Powdered emery.
Valve grinding compound.
Ground glass.
Metal polish.
Bath brick.
Soap and washing powder.
Wipers. This is the trade name for baled rags. They are washed and sterilized before baling and are far superior to cotton waste for use around oil engines. They have better absorbent quality than waste and do not shed lint and strings that will clog up oil holes and passages. Some of them come in large pieces and it will be found economical to direct the storekeeper to tear the large pieces into fairly uniform and convenient sizes.
Gage glasses, for oil tanks, mechanical oilers, etc.
Electric wire and cable.
Electric bulbs and fuses.
Diesel engine indicator.
Indicator cord.
Blank indicator cards. The use of chemically treated cards that can be marketed by a metal point instead of lead point is recommended.

SPARE PARTS

A reasonable amount of spare parts for main engines and auxiliary machinery should be carried but the tendency in the past has been to carry too many spares. The major spare parts required by the classification societies will ordinarily prove more than ample. These include such parts as cylinder heads, pistons, connecting rods, piston rings, bearing boxes, valves, etc., but it will sometimes be found desirable to carry additional small spares not called for by classification requirements, such as miscellaneous special springs and small valves.

PURCHASING FUEL OIL

There are some simple tests of fuel oil that can be made on board ship, but whenever oil is purchased the oil company's analysis should be required. It is not customary, however, to make a separate analysis of each small lot of fuel oil delivered to a ship. A large lot of any particular run from the refineries is stored at the tank farms and a random sample is taken from the lot for analysis. This analysis is then accepted as representing the quality of any shipment that may be made from that particular lot.

A sample analysis of this sort from a lot of standard Diesel engine oil sold by one of the large oil companies is as follows:

Gravity, Baumé	29.6 degrees
Flash point	175 degrees F.
Sulphur	0.4 of 1 percent
Cold test	0 degrees F.
Viscosity, Saybolt, at 110 degrees F.	48 seconds
Water	Slight trace
B. t. u. per pound	19,465

Such an analysis can be obtained before the oil is purchased, and when the oil is received a slight check on it may be obtained by measuring the Baumé gravity with the hydrometer carried on board. The method of using it will be understood from Fig. 19.

The B. t. u. content is of considerable importance since it indicates the amount of work that can be done by each pound of oil. To express it in another way, the B. t. u. per pound indicates how much fuel per hour will be consumed by the engines in normal operation. A simple check on the B. t. u. content can be made as follows: Having obtained the Baumé gravity in degrees, subtract 10 from it, multiply the remainder by 40 and add the result to 18,650. The sum will be the number of B. t. u.s per pound in the

Generated on 2024-09-12 12:02 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

oil and, if the gravity used is correct, the result thus obtained will seldom vary more than 1 percent from the laboratory determinations.

The engineer may sometimes be called upon to decide as to the suitability of a fuel oil when no analysis is available, and since elaborate testing apparatus is not to be had on shipboard the two tests just mentioned are of value.

The amount of water and sediment in the oil is also important, and a test that is fairly satisfactory can be made on board ship, if a suitable graduated glass container is available. The best kind is one that is graduated in cubic centimeters and will hold 100 centimeters. Graduates of

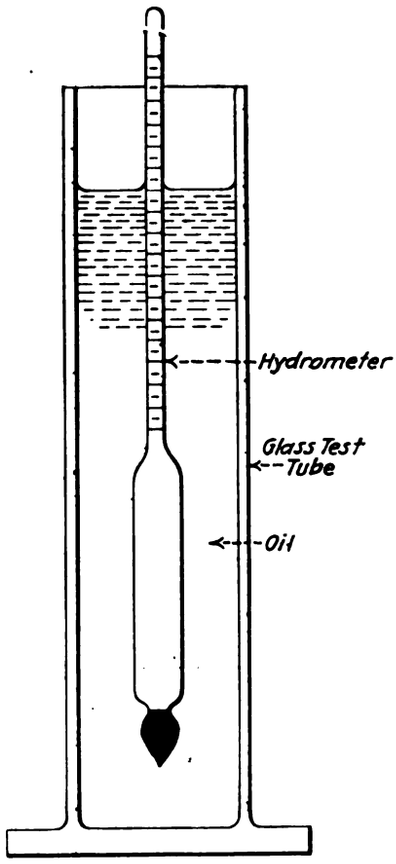


Fig. 19.—Measuring Baumé Gravity with Hydrometer

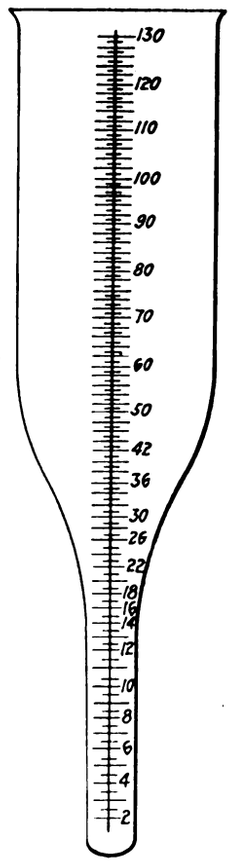


Fig. 20.—Test Tube for Measuring Water and Sediment Content

the shape shown in Fig. 20 can be obtained that have the lower end reduced in diameter so that each centimeter on the lower part of the scale is long enough to permit reading fractional parts. Into this container put 50 cubic centimeters of the oil to be tested and 50 cubic centimeters of gasoline. Shake thoroughly then let stand for two hours. The water and sediment will settle to the bottom and the amount can be measured by the graduations. This amount, divided by the amount of oil in the container, will give the percent of moisture and sediment in the oil. For example, assume that a mixture of 50 cubic centimeters of oil and 50 cubic centimeters of gasoline tested in this way settles out 2 cubic centimeters of water, then the percent of moisture contained in the lot of oil from which the sample was taken will be 2/50, or 4 percent.

Fuel oil to be safe to store in the ship's tanks and use in a Diesel engine should have a flash point of not less than 150 degrees F. When testing an unknown oil a rough determination of the flash point can be made as follows: Fill a small tin can or other metal container with the oil and heat it over a kerosene torch or any other available flame that will not heat it rapidly. Put a thermometer in the oil and, when it shows a temperature of somewhere near 150 degrees, light the end of a small piece of string and draw the lighted end quickly across the oil, not quite touching its surface. Do this after every one degree rise in temperature, and when a quick flash of blue flame follows the application of the lighted string the thermometer reading will be the flash point of the oil. This test should not be made in a strong light where the first faint flash of the flame may not be seen. If the first flash is not seen, a subsequent one at a higher temperature may be seen and a false flash point obtained. The flash point obtained in this way will usually be about 20 degrees higher than that obtained from the standard closed cup tester that is generally used in laboratories.

Precautions in Handling Fuel Oil

Engineers that are accustomed to handling harmless looking liquid fuel are apt to forget the potential dangers associated with it and neglect the precautions that should always be taken to prevent fires or explosions.

Fuel oil is non-explosive and very difficult to ignite in bulk, but the vapor from it is explosive when mixed with air. The vapor is heavier than air, and will accumulate in low levels, such as the bilges. For this reason open flames and sparks are dangerous in the engine room, principally because of the possibility of their being dropped into the bilge. Vapor is always present in oil filled bilges and in empty fuel tanks. The vapor that is blown out, whenever the air vent cocks on the discharge side of the fuel measuring pumps are opened, is explosive. In fact, any small leak in a high-pressure oil line is likely to emit vaporized oil in an explosive state, and smoking or the use of naked lights in the engine room should never be allowed.

When fuel is being pumped into the tanks the incoming oil forces the vapor out of the tanks through the vent pipes above deck and no flame or spark of any sort should be allowed in the vicinity of these vents. It is important to keep the wire gauze protectors in the ends of the vent pipes in good condition so that, if the outflowing vapor should become ignited, the flame can not travel back into the pipes. If the meshes of this wire gauze are allowed to become clogged with dirt, the air and vapor forced out of the tanks by the inflowing oil will develop sufficient pressure to burst the gauze and thus render it useless as a protector.

If it should be necessary to inspect the interior of an empty fuel tank, no one should be allowed to enter it until the oil vapor has been cleared out. This can be done by pumping the tank full of salt water and forcing the vapor out, or by steaming it out. When a large oil tank is fitted with glass gages, as is the case with some daily service tanks, it is good practice to keep the gage glass valves habitually closed, opening them when it is desired to take a reading. This will prevent flooding the engine room with oil by the accidental breaking of a gage glass.

An oil fire can not be extinguished with water; the water simply spreads the burning oil. It can be extinguished only by cutting off the air supply. This can be done with dry sand, steam or chemical extinguishers. Most modern motorships are equipped with fire extinguishing apparatus of either the CO_2 or the foam type. With the former a battery of steel bottles containing carbonic acid gas is permanently mounted at some place convenient to the engine room, with a pipe line leading to each oil tank. In case of fire in a tank the valve in the line to that tank is opened and the gas, which is non-combustible, flows into the tank and displaces the air. The foam type consists of two tanks centrally located and filled with certain chemicals which when mixed make a large volume of foam. The

Generated on 2024-09-12 12:05 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

chemicals are discharged onto the fire through a double hose with a mixing nozzle, and a heavy blanket of foam is formed over the fire, completely cutting off the air supply. This method is also applied in portable extinguishers that may be carried by hand to the vicinity of the fire. Whenever it becomes necessary to do any burning, welding or other kind of work requiring flame or producing sparks in the engine room a man should always be stationed close by with a portable extinguisher.

PURCHASE OF LUBRICATING OIL

There is no shipboard test of Diesel lubricating oil, other than actual use in the engine, that is of any value as an aid to the selection of the oil to be used. The motorship engineer in ordering lubricating oil can depend only on his past experience in making this selection. In the event that it becomes necessary to purchase oil at a place where the brands he has used are not available the next best guide is the standing and reputation of the firm that markets the oil. Most of the large oil companies have, by laboratory work and field experience, produced oils that are perfectly satisfactory for lubricating Diesel engines and, fortunately, some or all of these standard brands are available in most of the ports throughout the world. All of these oils will conform to the following general specifications:

Boiling point	600-700 degrees F.
Flash point	325-500 degrees F.
Viscosity, Saybolt	500-800 at 100 degrees F.
Gravity, Baumé	18-24
Carbon, percent	0.05-0.2
Sulphur	none

(*To be continued*)

Operating and Maintaining Marine Reaction Turbines

Practical Suggestions on the Proper Methods of Operating, Adjusting and Maintaining Both the Turbine and Reduction Gear

By O. M. Gordon*

ALL reaction turbines or combined reaction and impulse turbines (Westinghouse, Parsons and others) have close running tip clearances on the reaction blading. These close clearances are between the casing (stationary) blading tips and the rotor drum and between the rotor (moving) blading tips and the casing and are necessary due to the fact that the steam expansion takes place in the moving blading that revolves with the rotor as well as the stationary blading. The periphery of the rotor blading and rotor drums have to be very close (unlike the impulse turbine) in order to prevent steam leaking by and not doing useful work. The clearances range from 0.035 to 0.065 inch, which is a good margin of safety, provided the engineer thoroughly understands the method of maintaining them. He should know what the clearances are by taking them from the drawing and checking accurately when the turbine casing is lifted.

ROTOR BEARINGS

The rotor bearing oil clearances should be about 0.0015 inch per inch diameter of journals, which is ascertained by taking leads on all bearings. Each bearing has a bridge gage originally fitted by the manufacturer. This gage has dowel pins which fit into holes drilled into the housing for that purpose. Care must be taken that the metal surfaces of the bridge gage and housing are thoroughly clean or a false reading is liable to occur. When the bridge gage is in place the checking is done by the use of a feeler gage between the journal and lugs on the bridge gage.

Any deviation will be shown by checking these readings with the original readings stamped on the bridge gage, thus indicating the amount of wear on the bearing in any direction. The bearing wear should not be allowed to become excessive; say 0.01 inch maximum from the original clearance. At this point of wear, the bearings must be rebabbitted, as adjustments cannot be made. In remetaling the bearings great care should be taken that they are bored out central and bring the rotor back to the original bridge gage readings.

THRUST BEARING—KINGSBURY TYPE

This thrust bearing is extensively used on the reaction turbine and also on propeller shafts. It is used to keep the turbine rotor in correct axial position in relation to the blade clearances and packings. It consists of one collar keyed onto the shaft and working between twelve (six ahead and six astern) babbitt faced shoes or pads. On the back of each shoe is a hardened steel button which works against a ring holding the shoes in place, thus allowing the shoes to accommodate themselves to the thrust collar. The back of this ring that holds the shoes has a spherical seat which permits self-alinement of the ring and all the shoes to the collar. This bearing, has proven very satisfactory, and requires little attention.

There are several methods of checking the oil clearance in the bearing, but the one I find most accurate is with the thrust and housing completely assembled. Jack the rotor hard aft and scribe a straight line from a fixed point on the shaft to a fixed point corresponding on the housing, then jack the rotor hard forward; the measurement of the off-set in the line scribed will be the total oil clearance in the bearing. If the clearance is checked with any part of the bearing removed, especially the housing, it is liable to bind or jam some part inside when the removed part is replaced.

The pads and rings should be frequently examined for wear and left free for self-alinement. The upper half of the housings have slots into which fit keys made integral with the pad retainer rings, to prevent the rings and shoes or pads from turning. On the after side, or side next to the rotor bearings, where the shaft goes through the housing, is fitted a small brass or felt ring which prevents loss of oil from the thrust bearing around the shaft. At the oil discharge, usually at the top of the housing, is fitted a restriction plate of small area, to prevent the oil from being thrown away from the root of the rotating collar. In an emergency, if no spare pads are available, the astern pads can be changed and used on the ahead side; also shims, to take out excessive clearance, can be inserted between the spherical seat rings and the housing. However, the best procedure, if possible, is to remetal the pads to establish the original clearance.

GLAND PACKING

On the reaction turbine this consists of a packing case rolled into or bolted to the turbine casing. Into grooves in this packing case are inserted the packing strips, calked in or

* Turbine inspector for Hampton Roads, Va., district of U. S. Shipping Board.

Generated on 2024-09-12 12:26 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

fitted loose with a light spring back of each segment to hold it in contact with the spindle. In the latter type the packing strips are held in contact with the spindle, making a comparatively tight gland, but the wear on the packing is rather great and has a tendency to groove the spindle or rotor. In the former gland the packing strips are calked into grooves on the rotor alternately between strips in the packing case. The strips are machined with a fine edge which readily wears or curls if the spindle moves to any great extent from its original location. This arrangement makes a very good labyrinth gland.

Gland sealing and leak-off is, of course, necessary and is accomplished by pockets in each gland into which is led live steam and a leak-off pipe. Loss of steam, to a considerable extent, is prevalent here unless the gland control valves are properly manipulated. In some cases the auxiliary exhaust steam is connected to the gland system for sealing purposes, which is satisfactory and economical, as but a small amount of live steam is required for gland sealing. When running at about half or full speed ahead, the leakage from the high pressure turbine ahead gland (forward gland) is used for sealing the low pressure turbine glands and the astern gland on the high pressure element.

Some reaction type turbines have a water seal gland, which consists of a water runner rotating with the rotor, in a special pocket of the gland packing case, and is quite effective at certain speeds. The principal advantage of the water seal is the elimination of steam loss through the glands, with resulting uncomfortable heat in the engine room. However, with careful attention and manipulation of the gland steam sealing and leak-off valves, the loss will be nil.

Under ordinary operating conditions, with the cross compound unit, the ahead inlet pressure on the low pressure turbine is at or below atmospheric pressure, therefore, requiring a steam seal to prevent an ingress of air which, of course, quickly reduces the vacuum. While running ahead, both high pressure and low pressure astern elements are running in a vacuum and it is necessary, at all times, to keep these glands sealed with either leak-off steam from the high pressure ahead element, or live steam.

Diaphragm—High Pressure Turbine

The high pressure turbine of the cross compound units have a diaphragm installed, the purpose of which is to separate the ahead and astern elements. This prevents steam blowing into the element not in use and possibly doing damage. The diaphragm packing case is rolled into a division part, integral with the turbine casing. The packing strips are calked into grooves of the packing case and rotor shaft alternately, the same as the gland packing, and give a good labyrinth effect.

Relief Valves

These are fitted for safety, as the pressures on the low pressure ahead and astern elements are limited. One is located on the low pressure ahead inlet belt and is set to blow at about 5 pounds gage pressure. The other is located on the high pressure astern exhaust belt, and set to blow at about 15 pounds gage pressure. Under no circumstances should the pressure exceed these specified limits. The valves should be kept in good operating condition and removed, tested and replaced at frequent intervals. Nearly all the reaction cross compound units have astern elements composed entirely of impulse blading; usually two or three rows of blading or buckets mounted on a single disk.

Flexible Couplings

There are several types of these couplings; namely, pin, claw, jaw, and Falk-Bibby. They all serve the same purpose, i.e., allow the gear shafts and rotors to move freely and accommodate themselves to alinement. They are fitted between each rotor and the pinion gear shafts. Either type of coupling should be inspected frequently to ascertain the amount of wear, which should not exceed, approximately, 0.060 inch in pins and bushings or jaws and claws. The lubricating oil supply to the coupling is usually taken from the turbine bearing (after the oil passes through bearing) adjacent to the coupling where it enters special pockets and is then delivered to bearing surfaces through holes drilled for that purpose. It is easy to examine the coupling by lifting the housing, which should be done at frequent intervals, ascertaining that the oil ways are clear and that the coupling is free to move approximately ⅜ inch, or as designed.

Expansion of Turbine Casings

It is, of course, necessary to provide for the expansion and contraction of the turbine casings. Provision is usually made for this at the forward foundation, sometimes called the sliding foot. The supporting brackets have elongated holes through which the special holding-down bolts pass. These bolts contain a shoulder which prevents the nuts from jamming the sliding foot. This foot should always be kept clean and well oiled through holes provided for that purpose. I have seen several cases of badly warped turbine casings, which were undoubtedly caused by neglect of the sliding foot, resulting in it being seized and not functioning. Warped casings call for either complete renewal or reboring and reblading, which is very expensive and surely can be overcome by proper attention to the provision made for expansion and contraction of the casings.

Operation of Low Pressure or High Pressure Turbine Independently of the Other

Provision is always made for cutting out either turbine and running the other separately. This is accomplished by cross-over piping originally installed and containing valves or interchangeable blanks and rings. In case trouble is experienced with the high pressure turbine, the coupling between the rotor and the high speed pinion shaft should be disconnected and valves or blanks and rings changed to blank off this turbine and admit live steam direct to the low pressure ahead steam belt. This pressure should never exceed the manufacturers' limit, which is about (relief valve heretofore explained) 5 pounds gage. In case trouble is had with the low pressure turbine, the rotor should be disconnected as in the former case and valves or blanks and rings changed to permit the high pressure turbine to exhaust directly to the main condenser. The astern element's cross-over piping has to be changed in the same way in order to operate the astern turbines separately.

Several cases of this nature have come under my personal observation and the cutting out of either turbine with the valve arrangement can be effected rather quickly. With the blanks and rings in the piping, it requires more work and more time, but has been done in about six hours. With the valves, there is always the possibility of someone leaving them open, also of them leaking; whereas the blanks and rings (although more trouble to change) eliminate this danger.

The writer observed one case where the high pressure turbine bearings were burned out, causing serious internal damage to the unit, and instead of the engineering personnel making a thorough examination of the low pressure turbine and proceeding with it, if possible, the vessel was towed for approximately one thousand miles, with a perfectly good low pressure turbine. The reason for the failure of the high pressure turbine was the loss of lubricating oil supply to the bearings, but the responsibility for the vessel's total disablement, and subsequent tow, was obviously on the engineering personnel, as no one had any definite procedure to follow in case of a breakdown (although the chief had just completed a 15,000 mile voyage in the vessel), consequently when the breakdown did occur, no one knew what to do, nor how to do it and the ship was towed in.

Generated on 2024-09-12 12:14 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

RAISING TURBINE CASINGS

Before the engineering personnel attempts the raising of the casings (ordinarily this should be done by them) it is well to look over the drawings of the particular units in order to locate and remove all concealed nuts and bolts. The inner flange bolts of the low pressure casing joint and sometimes of the low pressure exhaust trunk joint are reached through a manhole in the exhaust trunk or by removing the exhaust trunk. Some have bolts extending through the upper half of the casing, also tap bolts through the turbine head, securing the dummy cylinder. It is best to remove all lagging from the casing to be assured that all of these bolts and nuts are removed before attempting to lift it.

After the casing is opened for internal examination it is well to examine all gland and diaphragm packing for possible wear and rotors and casings for corrosion and all blading for distortion of any kind, also to see that all reaction blading is perfectly clean.

DUMMY PISTON AND CYLINDER

All reaction turbines have this equipment, except a few, constructed hurriedly during the war, which since have been changed to the dummy type. It is very necessary to the reaction turbine in order to balance the rotor axially, i.e., to counterbalance the heavy thrust on the rotor, due to the steam pressure on the moving (rotor) blading and the forward end of the rotor drum.

There are two distinct types, namely, radial and axial. The axial type is called by many the side contact type. The dummy or balance piston revolving with rotor has alternate high and low square ridges machined on the periphery, the *sides* of which ***run very close*** to packing strips calked into the dummy cylinder; whereas with the radial type, the periphery of the alternate high and low ridges on the dummy run very close to packing strips fitted into the dummy cylinder. Both are good, but function differently.

The radial type is maintained in good condition so long as rotor bearings do not wear excessively, permitting the dummy piston to bear hard on the packing strips in the dummy cylinders. This, of course, wears down the packing in the bottom half and permits steam loss through the top half. If the rotor is raised to the original position by installing new bearings or remetaling, the steam loss still exists from leakage past the damaged packing in the bottom half of the dummy cylinder.

The axial type is not affected by a little wear on the rotor bearings, but the efficiency is controlled entirely by the rotor thrust bearing. When the rotor is hard forward, or in astern motion (thrust collar hard against pads), the clearance between the dummy cylinder packing strips and the forward sides of the ridges on the dummy piston is usually about 0.015 or 0.020 inch. Some steam, of course, leaks through this clearance but this leakage is not a total loss, as nearly all turbines have a leak-off or equilibrium pipe, leading from the back of the dummy (high pressure turbine) to the fifth stage ahead, or direct to low pressure ahead steam belt. This pipe, on the low pressure turbine dummy, is usually led to the exhaust belt. When running ahead the rotor thrust is in the aft direction and ample clearance is provided in the dummy for liberal wear on the thrust pads or shoes before damaging packing. However, any wear in the thrust bearings, permitting the rotor to move aft, increases the dummy clearance with resultant loss of steam. If any wear in the thrust takes place, while going astern, permitting the rotor to move forward, the dummy packing in this type is very likely to be stripped.

Nearly all of these turbines have an indicator installed for checking the amount of wear in the thrust bearing and the axial or fore and aft movement of the rotors. It is very important that frequent checking be made and the rotors kept within a few thousandths of an inch of the original position.

REACTION BLADE CLEARANCES

The axial clearance of the reaction blading, i.e., the clearance between the sides of the rotor blading and the casing blading is very liberal, usually about 3/16 inch. With this clearance, in case of thrust bearing trouble, ordinarily other minor trouble or warning will develop before blade rubbing occurs.

Some are equipped with a safety arrangement consisting of a machined shoulder on the rotors which bears against the forward face of the after rotor bearing, in case thrust pads are badly wiped or burned out. This same arrangement is on the forward end of the rotor, to guard against blade damage in maneuvering astern in case the thrust bearing is damaged. These clearances are originally ⅛ inch with the rotor in central position in relation to the reaction blading. The writer has seen more than one Parsons turbine saved by this arrangement.

On the reaction blading, both rotors and casing, the tip clearances range from 0.035 to 0.065 inch, which is a good margin of safety (close tip clearance means efficiency), provided the engineer frequently checks the bearing clearances and the original location of the rotor, in relation to these clearances, by the use of the bridge gage supplied with each unit for this purpose. The blade tips are drawn out or tapered at the ends, similar to a knife blade. In case the bearings wear excessively or become overheated and the babbitt metal wipes, permitting the rotor to drop, the blade tip, being thin, will curl over, thus preventing fracture of the blades at the point of binding or at the root; which would certainly occur should the full area of the blade section extend out to tip.

DEFLECTORS AND DIFFUSER RINGS

An oil deflector is usually fitted neatly to the rotor shaft between the end of the bearing next to the casing and gland to prevent loss of oil from the bearing; also to prevent contamination of the lubricating oil by steam escaping from the glands. There is also installed, on most turbines, a diffuser ring at the outside edge of the gland or casing, which is a decided advantage in keeping steam and water out of the lubricating system. It is very important that these appliances be kept in good condition and at no time should more steam be used than is absolutely necessary to secure good sealing and the prevention of ingress of air through the glands.

PROPELLER THRUST BEARING, KINGSBURY TYPE

This is usually located on the forward end of the main, or low speed, gear shaft and is practically the same in design as the turbine thrust (Kingsbury) heretofore outlined. The oil clearance should be frequently checked (originally about 0.020 to 0.030 inch) and necessary adjustments promptly made by inserting or removing shims back of the ring on the after side and between the end plate and the housing on the forward side. These adjustments or remetaling of pads are necessary in order to maintain the propeller shaft and gears in their original location relative to the gear case. A good plan is to fix an indicator on the gear casing or after low speed gear bearing housing, extending to a fixed point on the main shaft or coupling flanges. At a glance this will show any movement forward or aft from the original location, which is very important. I have seen several damaged gear sets due to excessive wear on the propeller shaft thrust bearings, which has a tendency to concentrate the power on one helix of the gear, resulting in rapid wear of the teeth.

REDUCTION GEAR (GENERAL)

The question is frequently asked by the operating engineer as to the specific life of the average marine gear set. This question is undoubtedly unanswerable, but it is needless to say that, if the gear cutting is accurate, of good design and properly installed, the responsibility for the life of the gear

Generated on 2024-09-12 12:03 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

set is dependent wholly on the skill of the operating engineer.

Maintained good alinement, thereby distributing the power equally over all tooth surfaces is the primary factor in the life of any reduction gear set. Indeed, not a few sets have been quickly ruined by bad alinement and tooth contact, which resulted in damaged teeth. The engineer should always consider this of primary importance. In remetaling any of the gear bearings, it is very important that gears be brought back to their original position, thus maintaining the same alinement and tooth contact. After the bearings are replaced, a little Prussian blue applied to one gear meshing into the other and jacking gears over, will readily show the tooth contact.

LUBRICATION

This is indeed very important and should at all times receive careful attention. If a good quality of lubricating oil is used, and a separator or purifier is installed, the engineer should, at all times, keep the oil in good condition and free of impurities by frequent cleaning of the tanks and the use of the separator. Heat the oil to about 160-170 degrees F. before purifying, in order that impurities may be separated out and held in suspension, making their extraction more certain. The oil spray nozzles delivering oil to the gear teeth should be frequently examined and cleaned. A good policy is to start the oil pump, open all inspection plates (if possible) on the gear case and ascertain that the teeth are receiving a good oil bath. As far as the writer knows, there is no criterion to guide us in condemning any gear set, but the conditions (pitting, undercutting, etc.) of each gear must be carefully observed and the decision be made, based on past experience and the exact condition of the gear inspected.

GOVERNORS

Some of the reaction turbines have a speed regulating governor, actuated from the rotor shaft through gears, levers and relay valve, which controls the main steam supply by operation of the main governor valve, placed in main steam line above the maneuvering valves. Some units have an automatic stop valve placed in the main steam line, which requires the operator to trip the valve by hand by pulling a lever in case of a broken shaft, thrown propeller blades, etc. In either case, the engineer should thoroughly understand the function of these devices, as applied to his units, and keep them in good condition.

Various manufacturers have their own particular appliances in connection with their turbines and gears, and the operating engineer should, by all means, obtain their descriptive pamphlets, which are usually cheerfully furnished, in order that he may thoroughly understand his equipment and keep it always in good operating condition.

Water Rates and Steam Consumption of Auxiliaries—V*

Steam Consumption of Auxiliaries in Port—Cargo Handling and Bunkering—Problems Showing Calculated and Actual Results

By E. A. Stevens, Jr.,† and H. E. Brelsford‡

WHEN the ship is in port the only auxiliaries of the first group that are in operation are the feed and fuel oil pumps, fuel oil heater, the forced draft blower in some cases and occasionally the fuel oil transfer pump. When taking on oil fuel the transfer pump is in operation most of the time. The engine and fire room bilge pumps are in operation only when needed, which is not often.

All of the auxiliaries of the second group excepting the steering engine are, more or less, in operation, depending upon the ship and conditions. On cargo ships these auxiliaries, with the exception of the steering engine and in some cases the ice machine, are working under practically the same conditions as at sea and their steam consumption will not vary materially. There is, however, another item to consider and that is the steam used by the cargo machinery, which in case of cargo, and passenger and cargo, ships are the winches and on tankers the cargo pumps.

PORT CONSUMPTION

In order to estimate the steam used in port, the assumption can be made that the steam used by the feed, fuel oil and the auxiliary air and circulating pumps is used in the feed water heater. Then calculate the steam necessary for the auxiliaries of the second group and the cargo machinery, if operated. This will be the approximate amount of steam condensed in the auxiliary condenser, from which the amount of circulating water and the steam necessary for the auxiliary air and circulating pumps can be calculated. Add to this the steam used in the galley and for heating and add about 25 percent of the above to allow for the steam used by the feed pumps, condensation in the pipes, etc. The sum will be the estimated amount of water pumped to the boilers from which the steam consumption of the feed pump can be calculated.

Before going farther it would be well to draw attention to the different conditions under which the auxiliaries of the second group work, when the ship is in port and at sea, which will be taken up under each heading as follows:

Steering Engine not working.

Dynamo Machine. On cargo ships and tankers the load will be practically the same when the ship is in port as it is at sea, unless the steering engine and blowers are operated by electricity, in which case the load on the generators can be found as already explained. On passenger ships, the port load will largely depend upon the extent to which the passenger accommodations are lighted. This load, which can be best obtained from the ship's logs, will be approximately one-third to one-half of that when the ship is at sea.

Sanitary Pump. On cargo ships and tankers the steam consumed in port will be the same as at sea, except where there is a sanitary pump attached to the main engine, in which case the calculations for the water pumped and the steam consumption of the independent pump used in port are made in the same manner as already explained.

On passenger ships the amount of water pumped would be only that necessary for the crew, if the water is shut off from the passenger quarters. If there is only one sanitary

* Copyright, 1924, by E. A. Stevens, Jr.

† Department of Maintenance and Repair, U. S. Shipping Board, Emergency Fleet Corporation, New York, and member of Fuel Conservation Committee, U. S. Shipping Board.

‡ Chief of Technical Section, Department of Maintenance and Repair, U. S. Shipping Board, Emergency Fleet Corporation, New York.

Generated on 2024-09-12 12:05 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

pump, and the load on the pump is considerably less than its normal capacity, the water rate as found on Fig. 9 (see page 549, September issue) should be increased by about 30 percent.

Fresh Water and Drinking Water Pumps. As the steam used by these pumps is not much, their steam consumption may be taken as equal to that when the ship is at sea.

Ice Machine. If the ice machine is used in port, its steam consumption is calculated in the same manner as already explained.

Other Auxiliaries. The steam consumption of all the other auxiliaries of this group, except the auxiliary condenser and its air and circulating pumps, is calculated in the same way as already explained.

CARGO MACHINERY

Winches. It is quite difficult to estimate with any degree of accuracy the steam used by winches but the following rules will give fairly good results:

An average of one horsepower developed during an hour will handle one ton (2,240 pounds) of cargo.

The steam consumed by the winches will be about 100 pounds per horsepower per hour.

Cargo Pumps. The indicated horsepower of cargo pumps when discharging cargo can be figured in the same manner as other pumps using Fig. 9 for obtaining the mechanical efficiency and water rates. The head against which this pump works varies with conditions.

BUNKERING

Coal. When coal is being taken on board and the ship's winches are being used for this purpose, use the rules given for winches when handling cargo.

Oil Fuel. If steam is supplied by the ship for heating the oil and operating the pump on the oil barge, the amount necessary can be found as follows:

For heating: Use the formula as given under "Fuel Oil Heater and Heating Coils." The temperature to which the oil is heated in this case will seldom exceed 90 degrees F.

For pumping: The total head will be about 60 percent greater than the difference in height of the highest part of the filling line and the level of oil in the barge, which is approximately that of the water. The indicated horsepower and steam consumption of the pump can be figured in the same manner as that for other pumps, using Fig. 10 for obtaining the mechanical efficiency and water rates.

Although the steam consumption when the ship is in port can not be determined with the same degree of accuracy as it can when at sea, the above will serve as a guide as to the efficiency of the engineering department. In a large number of cases the losses in port are much greater in proportion than at sea, due to the false impression that the fuel consumed is of such a small quantity, any saving that can be effected amounts to little. The main losses are due to not using the feed water heater, leaving the air registers of burners not in use open, and the unnecessary use of lights in the passenger quarters. The above will also serve as a guide in determining the size of the auxiliary condensers, which in many instances are too small for the work required of them.

PROBLEMS

As further illustrations and in order that comparisons can be made between the calculated and actual results, the following problems are given. The data such as pressures, temperatures, weight of water pumped to boilers, etc., are taken from the trial trip report, if given; when not given and assumptions have to be made, it is so stated.

PROBLEM I

Tanker *Ramapo* (see *Journal of the American Society of Naval Engineers*, Vol. XXXI, No. 4). Reciprocating engine. Air, engine room bilge and sanitary pumps attached to main engine.

Water pumped to boilers = 43,701 pounds per hour.
Fuel oil burnt = 3,246 pounds per hour.
Feed pump, 24-inch stroke.
Discharge pressure = 244 pounds.
Equivalent head = 244 x 2.31 = 564 feet.

$$\text{Water H.P.} = \frac{43{,}701 \times 564}{33{,}000 \times 60} = 12.45.$$

Mechanical efficiency, from Fig. 4 = 0.81.

$$\text{I.H.P.} = \frac{12.45}{0.81} = 15.38.$$

Water rate, from Fig. 4 = 61 pounds.
Steam consumption = 15.38 x 61 = 937 pounds per hour.

FORCED DRAFT BLOWER

Driven by a reciprocating engine.

$$\text{Air per minute} = \frac{3{,}246}{60} \times 19.7 = 1{,}066 \text{ pounds.}$$

Pressure at fan discharge in inches of water = 1.24 inches.

$$\text{Air H.P.} = \frac{1{,}066 \times 1.24}{470} = 2.81.$$

Take efficiency of fan at 0.45, then S.H.P. $= \frac{2.81}{0.45} = 6.24$

Water rate, from Fig. 5 (for 6.24 S.H.P.) = 45.5 pounds.
Corrected W.R. = 45.5 × 1.15 = 52.5 pounds.
Steam consumption = 6.24 × 52.3 = 327 pounds per hour.

FUEL OIL PUMP, 5-INCH STROKE

Fuel oil per hour = 3,246 pounds.
Discharge pressure = 164 pounds.
Equivalent head = 164 × 2.39 = 392 feet.

$$\text{Oil H.P.} = \frac{3{,}246 \times 392}{33{,}000 \times 66} = 0.642.$$

Mechanical efficiency from Fig. 6 = 0.60.

$$\text{I.H.P.} = \frac{0.642}{0.60} = 1.07.$$

Water rate, from Fig. 6 = 208.3 pounds.
Steam consumption = 1.07 × 208.3 = 223 pounds per hour.

FUEL OIL HEATER

Temperature of oil in tanks, t_1 = 70 degrees F.
Temperature of oil at burners, t_2 = 144 degrees F.
$t_2 - t_1$ = 144 — 70 = 74 degrees F.
Steam pressure in heater assumed 100 pounds.
Latent heat of 1 pound of steam at 100 pounds pressure = 880 B.T.U.

$$\text{Steam per hour} = \frac{3{,}246 \times 74}{880} = 273 \text{ pounds.}$$

FEED WATER HEATER

Temperature of water in feed tank, t_1 = 123 degrees F.
Temperature of water after passing through heater, t_2 = 196 degrees F.
$t_2 - t_1$ = 73 degrees F.
Auxiliary exhaust pressure, 12 pounds gage.
Latent heat of 1 pound of steam at 12 pounds gage = 949 B.T.U.

$$\text{Steam used in feed water heater} = \frac{43{,}701 \times 73}{949} = 336 \text{ pounds.}$$

MAIN CONDENSER

Total steam condensed in condenser and heaters = 42,161 pounds.
Steam condensed in feed water heater = 336 pounds.
Steam condensed in fuel oil heater = 273 pounds.
Steam condensed in condenser = 42,161 — (336 + 273) = 41,552 pounds.
Vacuum in condenser = 27½ inches.
Latent heat in 1 pound of steam at 27½ inch vacuum = 1,030 B.T.U.

MAIN CIRCULATING PUMP

Temperature of sea, t_1 = 70 degrees F.
Temperature of overboard discharge, t_2 = 101 degrees F.
$t_2 - t_1$ = 31 degrees F.

$$\text{Circulating water per minute} = \frac{41{,}552 \times 1{,}030}{31 \times 60} \times 1.035 = 23{,}800 \text{ pounds.}$$

Total head estimated at 20 feet.

$$\text{Water H.P.} = \frac{23{,}800 \times 20}{33{,}000} = 14.43.$$

Efficiency of pump, estimated = 0.67.

$$\text{Brake H.P.} = \frac{14.43}{0.67} = 21.53.$$

Water rate, from Fig. 5 = 39 pounds.
Corrected water rate = 39 × 1.15 = 44.8 pounds.
Steam per hour = 21.53 × 44.8 = 965 pounds.

STEERING ENGINE

Steam per hour = (0.1 × 2,930) + 150 = 443 pounds.

ICE MACHINE (2-TON MACHINE)

Steam per hour, from Fig. 15 = 275 pounds.

DYNAMO MACHINE

Number of persons on board during trial trip estimated at 60.

$$\text{Average K.W.} = \frac{60}{10} + 2 = 8.$$

Generated on 2024-09-12 12:23 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Dynamo machines rated at 20 K.W. each.

$$\text{Percent of load} = \frac{8}{20} = 0.40.$$

Water rate of full load, from Fig. 11 = 55.7 pounds.
Correction factor for 0.4 of full load, from Fig. 12 = 1.263.
Corrected water rate = 55.7 × 1.263 = 70.4 pounds.
Steam per hour = 8 × 70.4 = 563 pounds.

GALLEY, PANTRY, ETC.

Steam per hour = 60 × 0.6 = 36.

SUMMATION

First Group

Feed pumps	=	937
Forced draft blowers	=	327
Fuel oil pump	=	223
Fuel oil heater	=	273
Main circulating pump	=	965
		2,725
Add 10 percent	=	272
Total in pounds per hour	=	2,997

From Fig. 3 we find the steam consumption of the auxiliaries of the first group at 1,657 I.H.P. (or 56 percent of full load) will be 79.4 percent of what it is at full load. Then the steam consumption of auxiliaries of the first group at 1,557 I.H.P. = 2,997 = 0.794 = 2,380 pounds per hour.

Second Group, Etc.

Steering engine	=	443
Ice machine	=	275
Dynamo	=	563
Galley	=	36
		1,317
Add 10 percent	=	132
Total in pounds per hour	=	1,459

Totals

I.H.P.	2,960	1,657
Steam consumption (first group)	2,997	2,380
In pounds per hour (second group, etc.)	1,459	1,459
Total	4,456	3,839
Steam consumption measured	4,730	3,620
Percent difference	—5.8	+6.02

PROBLEM II

Tanker *Trinity* (see *Journal of the American Society of Naval Engineers*, Vol. XXXII, No. 4).

Cross compound turbines single reduction gear. All pumps independent.
Water pumped to boilers, 46,175 pounds per hour.
Fuel oil burnt, 3,333 pounds per hour.
Feed pump, 24-inch stroke.
Discharge pressure = 246 pounds.
Equivalent head = 568 feet.

$$\text{Water H.P.} = \frac{46{,}175 \times 568}{33{,}000 \times 60} = 13.25.$$

Mechanical efficiency (Fig. 4) = 0.81.

$$\text{I.H.P.} = \frac{13.25}{0.81} = 16.25.$$

Steam consumption = 16.35 × 61 = 1,000 pounds.

FORCED DRAFT BLOWERS

Driven by a reciprocating engine.

$$\text{Air per minute} = \frac{3{,}333}{60} \times 19.7 = 1{,}094 \text{ pounds.}$$

Pressure at fan discharge in inches of water = 1.3.

$$\text{Air H.P.} = \frac{1{,}094 \times 1.3}{470} = 3.025.$$

Take efficiency of fan at 0.45.

$$\text{S.H.P.} = \frac{3.025}{0.45} = 6.72.$$

Water rate, from Fig. 5 = 45.
Corrected water rate = 45 × 1.15 = 51.8 pounds.
Steam consumption = 6.72 × 51.8 = 348 pounds.

FUEL OIL PUMP

Fuel oil per hour = 3,333 pounds.
Discharge pressure = 117 pounds.
Equivalent head = 117 × 2.39 = 280 feet.

$$\text{Oil H.P.} = \frac{3{,}333 \times 279.5}{33{,}000 \times 60} = 0.47.$$

Mechanical efficiency from Fig. 6 = 0.60.

$$\text{I.H.P.} = \frac{0.47}{0.60} = 0.783.$$

Water rate, from Fig. 6 = 208.3 pounds.
Steam consumption = 0.783 × 208.3 = 163 pounds.

FUEL OIL HEATER

Temperature of oil in tanks, t_1 = 76 degrees F.
Temperature of oil to burners, t_2 = 153 degrees F.
$t_2 - t_1$ = 153 — 76 = 77 degrees F.
Steam pressure in heater, assumed, 100 pounds.
Latent heat of 1 pound of steam at 100 pounds pressure = 880 B.T.U.

$$\text{Steam per hour} = \frac{3{,}333 \times 77}{880} = 292 \text{ pounds.}$$

FEED WATER HEATER

Temperature of water in feed tank, t_1 = 115 degrees F.
Temperature of water after passing through heater, t_2 = 194 degrees F.
$t_2 - t_1$ = 194 — 115 = 79 degrees F.
Auxiliary exhaust pressure, 7 pounds gage.
Latent heat of 1 pound of steam at 7 pounds gage pressure, 957 B.T.U.

$$\text{Steam used in feed water heater} = \frac{46{,}175 \times 79}{957} = 381 \text{ pounds.}$$

MAIN CONDENSER

Total steam condensed in condenser and heaters = 45,800 pounds per hour.
Steam condensed in feed water heater = 381 pounds per hour.
Steam condensed in fuel oil heaters = 292 pounds per hour.
Steam condensed in condenser = 45,800 — (381 + 292) = 45,127 pounds.
Vacuum in condenser = 27.9 inches.
Latent heat of 1 pound of steam at 27.9 inches vacuum = 1,034 B.T.U.

MAIN CIRCULATING PUMP

Temperature of sea t_1 = 76 degrees F.
Temperature of overboard discharge, t_2 = 93 degrees F.
$t_2 - t_1$ = 93 — 76 = 17 degrees F.

$$\text{Circulating water per minute} = \frac{45{,}127 \times 1{,}034}{17 \times 60} \times 1.035 = 47{,}300 \text{ pounds.}$$

Total head, estimated, 20 feet.

$$\text{Water H.P.} = \frac{47{,}300 \times 20}{33{,}000} = 28.65.$$

Pump efficiency, estimated = 0.67.

$$\text{Brake H.P.} = \frac{28.65}{0.67} = 42.75.$$

Water rate, from Fig. 5 = 36 pounds.
Corrected water rate = 36 × 1.15 = 41.4.
Steam consumption = 42.75 × 41.4 = 1,770 pounds.

AIR PUMP, STROKE 18 INCHES

As a vacuum augmenter is fitted, take vacuum at air pump suction equal to 24 inches.

$$\text{I.H.P. of air pump} = \frac{45{,}127}{13{,}680} + 1 = 4.3.$$

Water rate, from Fig. 7 = 155 pounds.
Steam consumption = 4.3 × 155 = 666 pounds.

VACUUM AUGMENTER

Vacuum in condenser = 27.9 inches.
Vacuum at dry air suction, estimated = 28 inches.
Temperature of overboard discharge = 93 degrees F.
Temperature at dry air suction, estimated, 93 + 4 = 97 degrees F.
Air entering condenser in pounds per hour = (0.00025 × 45,127) + 7.5 = 18.75.
Steam per pound of air, from Fig. 8, about 100.

$$\text{Steam for augmentor} = 18.75 \times \frac{100}{10} = 187 \text{ pounds.}$$

LUBRICATING OIL PUMP, 8-INCH STROKE

Single reduction, cross compound, gravity system.
Oil pumped per minute in gallons.
[(0.025 × 2,810) + 100] × .75 × 1.20 = 153.
Pounds per minute = 153 × 7.72 = 1,181.
Pump discharge pressure, estimated = 25 pounds.
Pump discharge equivalent head = 25 × 2.5 = 62.5.
Suction head and head due to valve resistance estimated at 20 feet.
Total head, estimated = 82.5 feet.

$$\text{Oil H.P.} = \frac{1{,}181 \times 82.5}{33{,}000} = 2.95.$$

Mechanical efficiency, from Fig. 9 = 0.703.

$$\text{I.H.P.} = \frac{2.95}{0.703} = 4.2.$$

Water rate, from Fig. 9 = 221 pounds.
Steam per hour = 4.2 × 221 = 929 pounds.

ENGINE ROOM BILGE PUMP, 6-INCH STROKE

Bilge water pumped per minute = (0.2 × 2,810) + 200 = 762 pounds.
Draft, 26 feet.
Total head = 1.6 × 26 = 41.6 feet.

$$\text{Water H.P.} = \frac{762 \times 41.6}{33{,}000} = 0.96.$$

Mechanical efficiency, from Fig. 10 = 0.642.

$$\text{I.H.P.} = \frac{0.96}{0.642} = 1.496.$$

Water rate, from Fig. 10 = 319 pounds.
Steam consumption = 1.496 × 319 = 477 pounds.

STEERING ENGINE

Steam per hour = (0.1 × 2,810) + 150 = 431 pounds.

DYNAMO MACHINE

Number of persons on board during trial trip estimated at 60.

$$\text{Average K.W.} = \frac{60}{10} + 2 = 8.$$

Dynamo machines rated at 20 K.W. each.

$$\text{Percent of load} = \frac{8}{20} = 0.40.$$

Generated on 2024-09-12 12:16 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Water rate at full load, from Fig. 11 = 55.7 pounds.
Correction factor for 0.4 of full load, from Fig. 12 = 1.263.
Corrected water rate = 55.7 × 1.263 = 70.4 pounds.
Steam per hour = 8 × 70.4 = 563.

ICE MACHINE, 2-TON

Steam per hour, from Fig. 15 = 275.

SANITARY PUMP, 6-INCH STROKE

Number of persons on board during trial estimated at 60. Water pumped per minute = (60 × 3) + 200 = 380 pounds.
Discharge pressure, estimated, 25 pounds.
Total head = discharge head = 25 × 2.25 = 56.3 feet.

$$\text{Water H.P.} = \frac{380 \times 56.3}{33{,}000} = 0.648.$$

Mechanical efficiency, from Fig. 9 = 0.643.

$$\text{I.H.P.} = \frac{0.648}{0.643} = 1.02.$$

Water rate, from Fig. 9 = 253.
Steam consumption = 1.02 × 253 = 258 pounds.

GALLEY

Steam per hour = 60 × 0.6 = 36.

SUMMATION

First Group

Feed pump	=	1,000
Forced draft blowers	=	348
Fuel oil pump	=	163
Fuel oil heater	=	292
Main circulating pump	=	1,770
Main air pump	=	666
Vacuum augmenter	=	187
Lubricating oil pump	=	929
Engine room bilge pump	=	477
		5,832
Add 10 percent	=	583
Total in pounds per hour	=	6,415

Second Group

Steering engine	=	431
Dynamo machine	=	563
Ice machine	=	275
Sanitary pump	=	258
Galley	=	36
		1,563
Add 10 percent	=	156
Total in pounds per hour	=	1,719

Steam consumption in pounds per hour:		
First group	=	6,415
Second group	=	1,719
Total calculated	=	8,134
Steam consumption measured	=	7,810
Percent difference	=	3.96

At reduced loads there was too much difference between the powers developed when measurements were taken for the total water used for all purposes and that for the main turbines to make an estimate of the water rate of the auxiliaries at reduced loads. The shaft horsepowers were 2,295 and 2,165 respectively, the former being 6 percent greater than the latter.

PROBLEM III

U. S. Coast Guard cutter *Modoc* (see *Transactions of the Society of Naval Architects and Marine Engineers* of 1923).

The various auxiliaries of this ship were tested separately under various conditions, in order to obtain the steam consumed by each. Unfortunately the duration of each test was only 6 minutes and, therefore, the results obtained might not be considered quite as accurate as if the tests had been longer. However, as the sum of the results of these tests checks very closely with the water measurements taken on the runs, the accuracy on the whole is fairly well substantiated. The comparisons of the calculated and actual results as far as possible will be made for Run No. 5, when full power was developed.

FEED PUMP, 24-INCH STROKE

Discharge pressure = boiler pressure + 40 pounds = 241 pounds.
Equivalent head = 241 × 2.31 = 557.
Water pumped per hour = 44,140 pounds.

$$\text{Water H.P.} = \frac{44{,}140 \times 557}{33{,}000 \times 60} = 12.42.$$

Mechanical efficiency, from Fig. 4 = 0.81.

$$\text{I.H.P.} = \frac{12.42}{0.81} = 15.35.$$

Water rate, from Fig. 4 = 61.
Steam consumption = 15.35 × 61 = 936 pounds.
Steam consumption from trial trip report, 1,000 pounds.

FORCED DRAFT BLOWERS

Driven by a direct connected turbine, closed firerooom.
Fuel burnt per hour = 3,172 pounds.

$$\text{Air delivered by blowers per minute} = \frac{3{,}172 \times 19.7}{60} = 1{,}042 \text{ pounds.}$$

Air pressure in inches of water = 1.74.

$$\text{Air H.P.} = \frac{1{,}042 \times 1.74}{470} = 3.86.$$

Efficiency of fan, assumed = 0.45.

$$\text{S.H.P.} = \frac{3.86}{0.45} = 8.58.$$

Water rate, from Fig. 5 = 94.3 pounds.
Corrected water rate = 1.30 × 94.3 = 122.6 pounds.
Steam consumed per hour = 8.58 × 122.6 = 1,053 pounds.
Steam per hour from trial trip data = 1,540 pounds.

FUEL OIL PUMP, 5-INCH STROKE

Oil pumped per hour = 3,172 pounds.
Pressure at burners = 157 pounds. Pressure at pump discharge assumed to be 20 pounds higher, making same 177 pounds.
Equivalent head = 177 × 2.39 = 423.

$$\text{Oil H.P.} = \frac{3{,}172}{60} \times \frac{423}{33{,}000} = 0.678.$$

Mechanical efficiency, from Fig. 6 = 0.60.

$$\text{I.H.P.} = \frac{0.678}{0.60} = 1.13.$$

Water rate, from Fig. 6 = 208.3.
Steam consumed per hour = 1.13 × 208.3 = 235 pounds.
Steam per hour from test of pump No. 1 = 290 pounds.
Steam per hour from test of pump No. 2 = 530 pounds.

CIRCULATING PUMP

Steam condensed in condenser = 38,980 pounds per hour.
Temperature of sea and overboard discharge not given, but the rise in temperature of the circulating water is assumed to be 20 degrees F.
Vacuum in condenser = 27.66 inches.
Latent heat in one pound of steam at 27.66 inches vacuum = 1,032 B.T.U.

$$\text{Circulating water per minute} = \frac{38{,}980 \times 1{,}032}{20 \times 60} \times 1.035 = 34{,}700 \text{ pounds.}$$

Head, estimated, 20 feet.

$$\text{Water H.P.} = \frac{34{,}700 \times 20}{33{,}000} = 21.03.$$

Pump efficiency, estimated = 0.58.

$$\text{S.H.P.} = \frac{21.03}{0.58} = 36.3.$$

Water rate, from Fig. 5 = 70 pounds.
Corrected water rate = 1.30 × 70 = 91 pounds.
Steam consumed per hour = 36.3 × 91 = 3,303 pounds.
Steam per hour from trial trip report = 2,960 pounds.

AIR PUMP, 18-INCH STROKE

Steam condensed in condenser = 38,980 pounds per hour.
Vacuum at air pump suction, 28 inches.

$$\text{I.H.P. of air pump} = \frac{38{,}980}{6{,}960} + 1 = 6.6.$$

Water rate, from Fig. 7 = 155.
Steam consumption = 6.6 × 155 = 1,024 pounds per hour.
Steam per hour from trial trip report, 975 pounds.

BILGE PUMP (6½ × 8 × 8 SIMPLEX)

Double strokes per minute = 42.25.
Water pumped per minute, allowing 40 percent slip = 755 pounds.
Water pumped per minute = (0.2 × S.H.P.) + 200 = (0.2 × 2,656) + 200 = 731 pounds.
Take 750 pounds as water pumped per minute.
Mean draft = 14 feet.
Total head = 1.6 × 14 = 22.4 feet.

$$\text{Water H.P.} = \frac{750 \times 22.4}{33{,}000} = 0.509.$$

Mechanical efficiency, from Fig. 10 = 0.704.

$$\text{I.H.P.} = \frac{0.509}{0.704} = 0.723.$$

Water rate, from Fig. 10 = 280 pounds.
Steam consumed per hour = 0.723 × 280 = 203 pounds.
Steam per hour from trial trip report = 200 pounds.

SANITARY PUMP (8 × 8 × 12 SIMPLEX)

Double strokes per minute = 19.14.
Water pumped per minute = 727 pounds.
Discharge pressure, 26.2 pounds.
Equivalent head = 26.2 × 2.25 = 59 feet.

$$\text{Water H.P.} = \frac{727 \times 59}{33{,}000} = 1.3.$$

Mechanical efficiency, from Fig. 9 = 0.773.

$$\text{I.H.P.} = \frac{1.3}{0.773} = 1.68.$$

Water rate, from Fig. 9 = 170 pounds.
Steam consumed per hour = 1.68 × 170 = 286 pounds.
Steam per hour from trial report = 580 pounds.
A summation of the various items is as follows:

Generated on 2024-09-12 12:14 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

	Pounds Per Hour	
	Calculated	Actual
Feed pump	936	1,000
Forced draft blowers	1,053	1,540
Fuel oil pump	235	530
Circulating pump	3,303	2,960
Air pump	1,024	975
Bilge pump	203	200
Sanitary pump	286	580
Total	7,040	7,785

If 10 percent is added to the calculated results the two would be about equal.

PROBLEM IV

This test was made on a twin screw passenger ship fitted with cross compound turbines driving the propellers through single reduction gears. Unfortunately the ship had been given only a very short dock trial and the auxiliaries had not been given the attention that they should have had, consequently the pumps did not work smoothly due to the packing being set up too tight. This would make the mechanical efficiency lower, thereby increase the steam consumption, which was further increased due to the pipe covering not having been completed. The above would account at least for a large part of the difference between the calculated and the measured steam consumption.

Total steam condensed per hour (measured) = 163,550 pounds.
Make up feed water per hour (estimated) = 5,970 pounds.
Total water pumped to boilers per hour = 169,520 pounds.
Fuel oil burnt per hour, measured = 12,164 pounds.

First Group

MAIN FEED PUMPS, 24-INCH STROKE

Pressure at pump discharge = 353 pounds per square inch.
Equivalent head = 353 × 2.31 = 815 feet.

$$\text{Water horsepower} = \frac{169{,}520 \times 815}{33{,}000 \times 60} = 69.8.$$

Mechanical efficiency, from Fig. 4 = 0.81.

$$\text{I.H.P.} = \frac{69.8}{0.81} = 86.2.$$

Water rate, from Fig. 4 = 61 pounds.
Steam per hour = 86.2 × 61 = 5,260 pounds.

FORCED DRAFT BLOWERS

Four blowers driven by geared turbines.
Closed fireroom.
Oil burnt per hour = 12,164 pounds.

$$\text{Air per minute} = \frac{12{,}164 \times 19.7}{60} = 3{,}990 \text{ pounds.}$$

Air pressure in fireroom = 0.65-inch.

$$\text{Air H.P.} = \frac{3{,}990 \times 65}{470} = 5.52.$$

Efficiency of blowers (estimated) = 0.45.

$$\text{S.H.P. of all blowers} = \frac{5.52}{0.45} = 12.26$$

$$\text{S.H.P. of one blower} = \frac{12.26}{4} = 3.06.$$

Water rate, from Fig. 5 (for S.H.P. = 3.06) = 81.5 pounds.
Corrected water rate = 1.3 × 81.5 = 106 pounds.
Steam per hour for one blower = 3.06 × 106 = 324 pounds.
Steam per hour for 4 blowers = 4 × 324 = 1,296 pounds.

FUEL OIL PUMPS

Oil pumped per hour = 12,164 pounds.
Pressure at pump discharge = 193 pounds.
Equivalent head = 193 × 2.39 = 461 feet.

$$\text{Oil horsepower} = \frac{12{,}164 \times 461}{33{,}000 \times 60} = 2.83.$$

Mechanical efficiency, from Fig. 6 = 0.745.

$$\text{I.H.P.} = \frac{2.83}{0.745} = 3.8.$$

Water rate, from Fig. 6 = 150 pounds.
Steam consumption 3.8 × 150 = 570 pounds.

FUEL OIL HEATERS

As the fuel oil used was very light, it was not necessary to heat that in the double bottoms. In this case the steam used would be about 60 percent of that given by the formula.
Temperature of sea = t_1 = 43 degrees F.
Temperature at burners = t_2 = 169 degrees F.
$t_2 - t_1$ = 169 — 43 = 126 degrees F.
Steam pressure in fuel oil heaters, assumed, 100 pounds.
Latent heat of 1 pound of steam at 100 pounds pressure, 880 B.T.U.
Fuel oil burnt per hour = 12,164 pounds.

$$\text{Steam used per hour} = \frac{12{,}164 \times 126}{880} \times 0.6 = 1{,}045 \text{ pounds.}$$

FUEL OIL TRANSFER PUMPS

Steam used by fuel oil pumps, 570.
Steam used by fuel oil transfer pump = 570 × 0.4 = 228 pounds.

FEED WATER HEATER

Temperature of feed water, entering heater = t_1 = 101 degrees F.
Temperature of feed water leaving heater = t_2 = 215 degrees F.
$t_2 - t_1$ = 215 — 101 = 114 degrees F.
Auxiliary exhaust pressure, 12.5 pounds gage.
Latent heat of 1 pound of steam = 949 B.T.U.
Water pumped to boiler = 169,520 pounds.

$$\text{Steam used per hour} = \frac{169{,}520 \times 114}{949} = 20{,}370 \text{ pounds.}$$

MAIN CONDENSERS

Total steam condensed per hour, 163,550 pounds.
Steam condensed in feed water heater per hour, 20,370 pounds.
Steam condensed in fuel oil heater, 1,045 pounds.
Steam condensed in condensers = 163,550 — (20,370 + 1,045) = 142,135 pounds.

$$\text{Steam condensed in one condenser per hour} = \frac{142{,}135}{2} = 71{,}067 \text{ pounds.}$$

$$\text{Steam condensed in one condenser per minute} = \frac{71{,}067}{60} = 1{,}185 \text{ pounds.}$$

Vacuum in condenser = 28.7 inches.

CIRCULATING PUMPS

Driven by reciprocating engines.
Temperature sea = t_1 = 43 degrees F.; discharge = t_2 = 71 degrees F.
$t_2 - t_1$ = 71 — 43 = 28 degrees F.
Latent heat of 1 pound of steam at 28.7 inch vacuum = 1,042 B.T.U.
Steam condensed in one condenser per minute = 1,185 pounds.

$$\text{Circulating water} = \frac{1{,}185 \times 1{,}042}{28} \times 1.035 = 45{,}600 \text{ pounds per minute for each condenser.}$$

Head assumed to be 20 feet.

$$\text{Water H.P. of one circulating pump} = \frac{45{,}600 \times 20}{33{,}000} = 27.63.$$

Pump efficiency assumed to be 0.67.

$$\text{Brake H.P.} = \frac{27.63}{0.67} = 41.3.$$

Water rate, from Fig. 5 = 36 pounds.
Corrected water rate = 36 × 1.15 = 41.4 pounds.
Steam per hour both pumps = 2 × 41.3 × 41.4 = 3,420 pounds.

MAIN AIR PUMPS, 21-INCH STROKE

Vacuum in condenser = 28.7 inches.
As a vacuum augmenter is fitted, the vacuum at the air pump suction will be assumed to equal 28.7 inches — 4 inches = 24.7 inches.
Steam condensed in pounds per hour in one condenser = 71,067.

$$\text{I.H.P. of each air pump} = \frac{71{,}067}{12{,}504} + 1 = 6.68.$$

Water rate, from Fig. 7 = 137 pounds.
Steam per hour for both pumps = 2 × 6.68 × 137 = 1,830 pounds.

VACUUM AUGMENTERS

Air per hour (for each condenser) = (0.00025 × 71,067) + 7.5 = 25.27 pounds.
Overboard discharge temperature = 71 degrees F.
Temperature of air = 71 + 3 = 74 degrees F.
Vacuum at air suction = 28.8 inches.
Steam per pound of air, from Fig. 8 = 7.3 pounds.
Steam per hour for both augmenters = 2 × 7.3 × 2,527 = 369 pounds.

ENGINE ROOM BILGE PUMPS, 12-INCH STROKE

Water pumped per minute (0.2 × 12,000) + 200 = 2,600 pounds.
Total head = 1.6 × 32 = 51 feet.

$$\text{Water H.P.} = \frac{2{,}600 \times 51}{33{,}000} = 4.02.$$

Mechanical efficiency, from Fig. 10 = 0.773.

$$\text{I.H.P.} = \frac{4.02}{0.773} = 5.2.$$

Water rate, from Fig. 10 = 215 pounds.
Steam per hour = 5.2 × 215 = 1,120 pounds.

LUBRICATING OIL PUMPS, 14-INCH STROKE

Gallons of oil pumped for each unit, measured from the lubricating oil pump piston displacement, allowing 30 percent slip = 145.
Weight of oil pumped per minute for each unit = 145 × 7.72 = 1,120 pounds.
Pressure at pump discharge = 35.5 pounds per square inch.
Equivalent discharge head = 35.5 × 2.5 = 89 feet.
Resistance due to pump valves, estimated 6 pounds per square inch.
Equivalent head = 6 × 2.5 = 15 feet.
Suction head estimated at 6 feet.
Total head = 89 + 15 + 6 = 110 feet.

$$\text{Oil horsepower for one pump} = \frac{1{,}120 \times 110}{33{,}000} = 3.73.$$

Mechanical efficiency, Fig. 9 = 0.795.

$$\text{I.H.P.} = \frac{3.73}{0.795} = 4.69.$$

Water rate, from Fig. 9 = 151 pounds.
Steam per hour for both units = 2 × 4.69 × 151 = 1,416 pounds.

LUBRICATING OIL COOLING WATER PUMP (24-INCH STROKE)

One pump supplying water to both oil coolers.
Water pumped per minute measured from piston displacement, allowing 25 percent slip = 7,230 pounds.

Generated on 2024-09-12 12:05 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Pressure at pump discharge = 15 pounds per square inch.
Equivalent head = 15 × 2.25 = 33.75 feet.

$$\text{Water horsepower} = \frac{7{,}230 \times 33.75}{33{,}000} = 7.4.$$

Mechanical efficiency, from Fig. 9 = 0.85.

$$\text{I.H.P.} = \frac{7.4}{0.85} = 8.7.$$

Water rate, from Fig. 9 = 96.
Steam per hour = 8.7 × 96 = 836 pounds.

Second Group

STEERING ENGINE

Steam per hour = (0.1 × 12,000) + 150 = 1,350 pounds.

SANITARY PUMP (12-INCH STROKE)

Number of crew, about..... 250
Number of trial trip staff and guests in first class quarters..... 100
Water for crew = (250 × 3) + 200 = ... 950
Water for trial trip staff and guests = 100 × .45 = ... 45
Total water pumped per minute = 950 + 45 = ... 995

As the third class quarters were not in use the water pumped was only about 50 percent of the normal capacity of the pump, therefore the water rate would be somewhat higher than that given on Fig. 9; this allowance may be taken at 25 percent, making the water rate = 170 × 1.25 = 212.5 pounds.
Pressure at pump discharge = 75 pounds.
Equivalent head = 75 × 2.25 = 169 feet.

$$\text{Water horsepower} = \frac{995 \times 169}{33{,}000} = 5.1.$$

Mechanical efficiency, from Fig. 9 = 0.773.

$$\text{I.H.P.} = \frac{5.1}{0.773} = 6.6.$$

Steam per hour = 6.6 × 212.5 = 1,400 pounds.

DYNAMO MACHINE

Four 50 K.W. generators driven by direct connected turbines.
As the trial was run during the day only a small part of the living quarters were open and the amount of electric current used was much less than what is used in operation.

Number of machines in operation..... 1
Average K.W. generated..... 35.4
Rated K.W. of machine..... 50

$$\text{Percent of load} \frac{35.4}{50} \times 100 \text{ .....} \quad 70.8$$

Steam pressure ..... 170 pounds gage
Back pressure ..... 12 pounds gage

Water rate, from Fig. 13, for 50 K.W. machine = 61 pounds.
Water rate corrected for direct connected turbine = 61 × 1.15 = 70.1 pounds.
M, from Fig. 14 = 1.125.
Steam per hour = 1.125 × 70.1 × 35.4 = 2,790 pounds.

FRESH WATER AND DRINKING WATER PUMPS

Number of persons on board = 350.
Steam per hour = 0.2 × 350 = 70 pounds.

ICE MACHINE

Three 10-ton machines with independent cooling water pump. Brine system.
Steam per hour, from Fig. 15 = 1,035 pounds.
Add 15 percent for cooling water pump, 155 pounds.
Add 15 percent for brine pump, 155 pounds.
Total steam per hour, 1,345 pounds.

GALLEY HEATING WATER, ETC.

Number of persons on board, 350.
Steam per hour = 350 × 0.9 = 315 pounds.

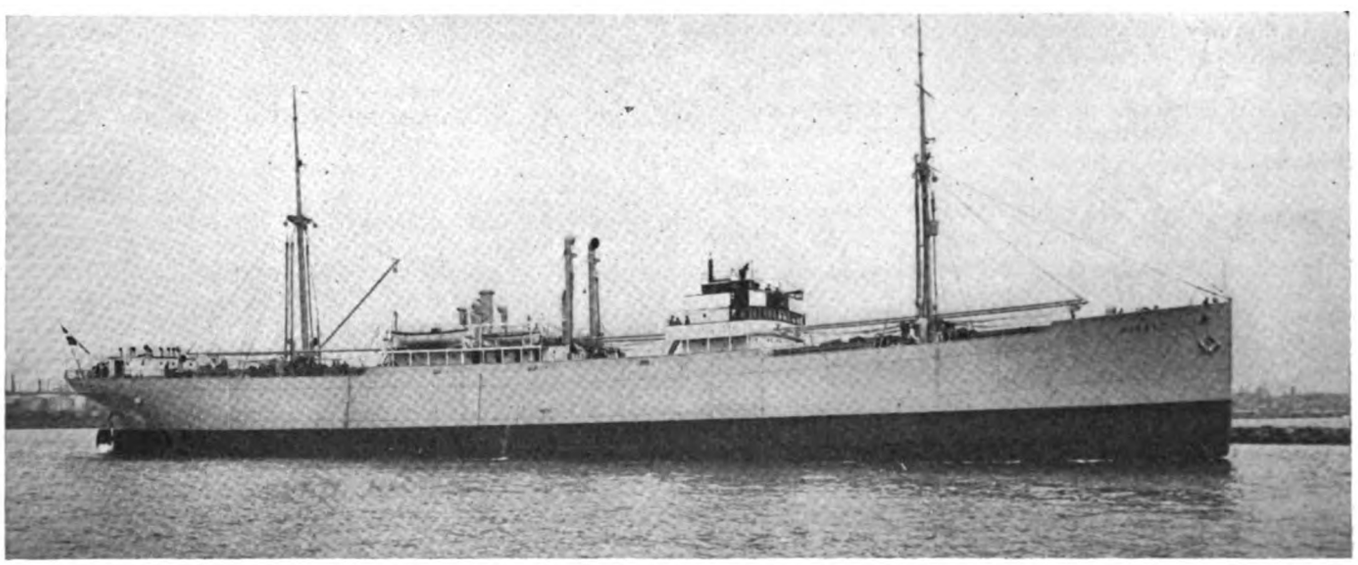
SUMMATION

First Group	Pounds of Steam Per Hour
Feed pumps	5,260
Forced draft blowers	1,296
Fuel oil pumps	570
Fuel oil heaters	1,045
Fuel oil transfer pump	228
Circulating pumps	3,420
Air pumps and vacuum augmenter	2,199
Engine and fireroom bilge pumps	1,120
Lubricating oil pumps	1,416
Lubricating oil cooling water pump	836
	17,390
Add 10 percent	1,739
Total for first group	19,129
Second Group	
Steering engine	1,350
Sanitary pump	1,400
Dynamo machine	2,790
Fresh water and drinking water pumps	70
Ice machine	1,345
	6,955
Add 10 percent	696
Total for second group	7,651

Steam for galley, etc., 315 pounds.
Total steam for purposes other than main turbines calculated = 19,129 + 7,651 + 315 = 27,095 pounds.
Steam used for purposes other than main turbines measured, 30,680 pounds.

(To be continued)

CAPTAIN H. W. BARSTOW of the *Henry R. Mallory* was presented with a gold medal by the Life Saving Benevolent Association of New York on October 8, just before the sailing of his ship for Galveston which marked his retirement from thirty-five years of active service with the Mallory Line. The medal was in recognition of heorism in saving life at sea on January 16, 1924.



Twin Screw Motor Cargo Ship Rigel of 3,828 Gross Tons and 2,100 Indicated Horsepower. Built by Burmeister and Wain for the Bergenske Dampskibsselskab, of Bergen

The Rigel is 382 feet long overall, 51 feet 3 inches beam, molded, 34 feet depth molded to shelter deck. Propulsion is by twin screws driven by Burmeister and Wain Diesel engines developing 2,100 indicated horsepower at about 130 revolutions per minute. The daily fuel oil consumption of 6 to 6½ tons gives the vessel a cruising radius of about 45,000 sea miles. Electric current for driving all auxiliaries is supplied by two 66-kilowatt and one 33-kilowatt generators, driven by Diesel engines. The total weight of the machinery, including auxiliaries, piping, shafting and propellers and electrical equipment, is 312 tons. On trial the vessel attained a mean speed of 11.47 knots with a fuel consumption of 0.291 pound per indicated horsepower hour.

Generated on 2024-09-12 12:04 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Questions and Answers Relating to Naval Architecture and Marine Engineering

Conducted by James L. Bates, Naval Architect, and W. B. Newton, Marine Engineer

This department is maintained for the purpose of answering all questions relating to ships and their machinery. All inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless the editor is given permission to do so.

Transatlantic Speed Records

Q. (1,275).—What are the official figures for the fastest transatlantic voyages as they stand at present and what ships have made such records?

A. (1,275).—The fastest transatlantic voyages as made by the steamship *Mauretania* of the Cunard Steamship Company, Ltd., are as follows. In each case these figures represent world's records inasmuch as no other liner has equalled or bettered them:

New York to Cherbourg, August 20-25, 1924, 5 days 1 hour 49 minutes; total distance, 3,195 miles; average speed, 26.25 knots.

Cherbourg to New York, August 9-14, 1924, 5 days 3 hours 20 minutes; total distance, 3,157 miles; average speed, 25.60 knots.

New York to Plymouth, September 10-15, 1924, 4 days 21 hours 57 minutes; total distance, 3,026 miles; average speed, 25.65 knots.

Queenstown to New York, September 10-16, 1910, 4 days 10 hours 41 minutes; total distance, 2,780 miles; average speed, 26.06 knots.

New York to Queenstown, September 15-21, 1909, 4 days, 13 hours 41 minutes; total distance, 2,809 miles; average speed, 25.78 knots.

The best day's run eastbound or westbound is 676 miles made by the *Mauretania* while on a westbound trip January 26, 1911. The average speed for this day's run was 27.04 knots. This is also the best average speed for one day.

The fastest transatlantic passage made by the steamship *Leviathan,* operated by the United States Lines, is as follows:

New York to Cherbourg, September, 1923, 5 days 8 hours 38 minutes; average speed, 24.17 knots.

Cherbourg to New York, November, 1923, 5 days 7 hours 20 minutes; average speed, 24.81 knots.

The fastest transatlantic voyage made by the *Majestic* of the White Star Line was in September, 1923, on the New York to Cherbourg run which was made in 5 days 5 hours and 21 minutes.

Camber of Launching Ways

Q. (1,277).—Please explain why some shipyards give a camber to the launching ways and others do not. What advantages are derived and also what disadvantages, if any, are incurred by cambering the ways? How much camber is usually given to the ways?

A. (1,277).—The practice of launching vessels on straight or on cambered ways is largely one of choice based on economic and safety considerations which obtain at the various shipbuilding plants. The employment of cambered ways came into use as a result of the increasing size of vessels and the necessity for keeping the pressures on the ways at certain critical periods during the launch within a safe limit without incurring too extensive alterations to existing facilities. It appears, however, that in the first instances of giving camber to the ways, the primary, if not the sole idea, was to overcome the effect of any possible subsidence of the ground. Such an occurrence seems a remote probability on a properly constructed sub-structure, even in the case of the heaviest vessels launched. The more vital aspects, the effect of camber upon pressures and moments, were apparently lightly considered, if at all.

A very complete presentation of this subject is contained in the three papers read before the Institution of Naval Architects; these with the discussion following each may be found in the *Transactions* of that body as follows:

(a) "On launching Calculations, with Special Reference to the Effect of Camber," by John Smith, Esq., R. C. N. C., Member, 1909.

(b) "Launching Declivities for Ships and Their Influence upon Poppet and Way-End Pressures," by A. Hiley, Esq., Associate Member, 1913, part I.

(c) "On Launching," by Percy A. Hillhouse, Esq., B. Sc., Member of Council, and William H. Riddlesworth, Esq., M. Sc., M. Eng., 1917.

From these papers it appears that as a result of giving camber to the ways the following *advantages* are obtained:

(1) An increase in the moment against tipping;
(2) A decrease in the run before the stern lifts;
(3) A decrease in the maximum pressure on the after ends of the groundways.

While, on the other hand, these *disadvantages* are shown to occur but to a lesser extent, however:

(1) An increase in the load on the fore poppet when the stern lifts.
(2) An increase in the rapidity of the fluctuations of this load after the stern lifts;
(3) A decrease (for a given mean declivity), the declivity at starting.

The effect of even a moderate camber is very much greater than that obtainable by any practicable increase of declivity for straight groundways.

The amount of camber given to the ways varies with the size of the vessel to be launched and various local conditions. The very moderate camber of the launching ways of the *Lusitania,* as given by Mr. W. J. Luke, was 16 inches in 800 feet which had the effect of an equivalent rise of tide of 1.24 feet. Had the camber been 32 inches in 800 feet the equivalent rise of tide would have been 5.22 feet. The camber of the ways for some recent battleships has been slightly less than one foot in 640 feet.

Gasket Materials to Resist Fuel Oil and Salt Water

Q. (1,278).—What are the most satisfactory gasket materials for manhole covers on tanks alternately filled with fuel oil and salt water?

A. (1,278).—A number of kinds of material have been used with varying results for oil-tight gaskets. It has generally been found that a given material which proved fairly satisfactory for use with fuel oil did not meet the necessary requirements for salt water and vice versa.

Several varieties of gasket material having the necessary characteristics to resist fairly well the action of both fuel

Generated on 2024-09-12 12:04 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

oil and salt water are now manufactured and sold under various trade names.

The United States Navy Department, after satisfactory tests, has approved for naval use gasket materials of a flexible rubber compound in sheet form known to the trade as Paramo, Karbonite, and Indestructible for manhole covers on tanks used strictly for fuel oil and also for alternate fuel oil and salt water.

Helm Indicator

Q. (1,279).—On a small motor tug equipped with both pneumatic steering gear and hand steering wheel, what is a desirable type of helm indicator to use when the pneumatic gear is in operation?

A. (1,279).—A simple and satisfactory type of helm indicator may be obtained by passing a small linked chain or wire (with chain in way of sheaves) around the rudder head, thence to the pilot house, so arranged as to actuate a small pointer representing the tiller or rudder and swinging over a dial graduated in degrees from center or mid position.

Attaching Tiller Cable to Steering Wheel Drum

Q. (1,280).—How should the bronze tiller cable used with a hand steering wheel be attached to the drum, when the drum is of small diameter?

A. (1,280).—If the drum is not too small, a hole may be drilled in the barrel and the end of the tiller cable passed through and knotted on the inside.

If the drum is too small or the preceding scheme is impracticable for any other reasons, it may be possible to drill through the rim close to the barrel, pass the end of the cable through and knot on the outside of the rim.

In either case the fastening is supposed to take no direct strain, the length of the cable being such that there are always several complete turns upon the drum.

Suctions for Fuel Oil Tanks

Q. (1,281).—Should high and low suctions be fitted to independent fuel oil tanks of 400 gallons capacity?

A. (1,281).—Owing to the small capacity of the tanks you mention, only one suction need be fitted. High and low suctions are practical only for deep tanks of considerable capacity where the settled water may accumulate to some depth. In the case of small shallow tanks it is doubtful whether a low suction can be placed close enough to the bottom for satisfactory operation unless sumps are fitted in the bottom of the tanks.

Any residual water or "sludge" may be removed from small tanks by a hand pump through a hose line.

Trial Data of Motor Tug

Q. (1,283).—Please give a list of the data that should be taken on the dock and sea trials of a small motor tug.

A. (1,281).—Owing to the small capacity of the tanks you contrary, it is assumed that the contract under which your vessel is building does not specify the character of the trials to be run. Under such circumstances, the principal objects of the trials become the determination of corresponding values of speed, revolutions and power, and the fuel consumption to be expected over a fair range of speed at a given displacement and under favorable conditions of wind, sea and ship's bottom.

It is generally desirable to have two trials, a dock and a sea trial. The former is carried out to insure that each of the various machinery units is in readiness to operate without damage to itself or to the adjacent structure and to facilitate the discovery of inaccuracies in adjustment, lacks in equipment, etc. The latter is to ascertain with accuracy the efficiency which may be expected both from the installation as a whole and from its component parts when functioning as designed under favorable conditions.

The sea trial really should comprise standardization trials and an endurance trial. The standardization trials consist of a series of runs over the measured mile at four or five different speeds, so selected as to cover the anticipated speed range satisfactorily. Generally three runs are made at each speed, alternately with and against the tide, the speed, revolutions per minute and power being obtained in each case. It is then possible to plot curves showing the mutual variation of these characteristics.

The endurance trial is a trial run at a predetermined speed and is usually of at least twelve hours' duration. The speed selected is usually the service speed of the vessel. The oil and water consumption are carefully measured and the general functioning of the machinery noted.

The dock trial should be of about six hours' duration. The main engines should be gradually warmed up and turned over at slow speed prior to the beginning of the trial in order to obtain assurance that all are in satisfactory working order. They should then be turned up to the designed revolutions or as near thereto as may be with the vessel moored to the dock.

During this trial all the required data should be taken at regular intervals. Especial note should be made of lubricating oil, circulating oil and piston cooling oil temperatures, condition of bearings, pressures and the working condition of the various parts.

At some time during the trial the engine should be reversed and run astern for a quarter of an hour at the greatest obtainable speed, then again reverse and run ahead till the end of the trial.

After this trial, cylinder and valve chest covers should be removed and examination made of the cylinders and of the piston rings.

There follow miscellaneous items which should be carefully noted.

Prior to the start of any trial a thorough examination of the holding-down bolts of all engines and auxiliaries should be made to insure that all are secure. During each run the engines should maintain as nearly as practicable the designed pressures, and the designed number of revolutions.

Full speed trials should be carried out in ample depth of water to insure escaping the increased wave making resistance due to restricted depths of channel. This would probably mean at least 50 or 60 feet in your case.

The kind and quality of fuel oil used should be carefully noted and recorded.

A long straight run should be made at each end before coming onto the course.

Every effort should be made to secure proper steering while on the course as the rudder when put over to even a small angle has a noticeable effect on speed.

The drafts before and after the trials should be carefully read and the amount of fuel, water, stores, number of crew, etc., accurately recorded.

The standardization trials should take place as soon as practicable after the boat comes out of dock because the fouling of the bottom increases the resistance by a marked but unknown amount. Therefore, the value of data obtained from trials conducted after considerable fouling has taken place is rendered problematical by the uncertainty of the conditions under which obtained.

For further information see:

Taylor's "Speed and Power of Ships."
Sterling's "Marine Engineer's Handbook."
Baker's "Ship Form, Resistance and Screw Propulsion."

The foregoing has been furnished in response to your request in order to convey a good general idea of the sub-

Generated on 2024-09-12 12:05 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

ject. In the opinion of the writer a good dock trial and several properly conducted high speed runs will furnish the data you need and fully meet the requirements of practice.

NEW BOOKS

THE SHIP AND HER WORK. By Sir Westcott Abell, K. B. E. Size, 5½ by 8½ inches. Pages, 714. Illustrated. London, 1924: Gee & Co., Ltd.

The prefatory note in this volume explains that the book contains the substance of a series of lectures which were delivered at the London School of Economics, during the summer term of 1922, to students who were specializing in the study of shipping questions, as part of a course laid down for the degree of Bachelor of Commerce in the University of London. The aim throughout has been to make plain to the reader the more important physical principles which have to be taken into account in the construction and operation of ships.

A. S. M. E. CONDENSED CATALOGUES OF MECHANICAL EQUIPMENT. Fourteenth annual volume. Size, 8½ by 11½ inches, Pages, 758. Illustrated. New York, 1924-25: The American Society of Mechanical Engineers.

This edition of the Mechanical Equipment Catalogue shows a gain over the previous issue of 527 pages of catalogue data carried by 430 firms. The general usefulness of the catalogue is greatly enhanced by this increase. There are over 2,400 illustrations shown in the volume. The Mechanical Equipment Directory (classified) has also increased in comprehensiveness containing over 31,000 listings. Being compiled on a basis of adequate free listings, it is an unbiased directory of manufacturers in the mechanical engineering field.

A CHAPTER IN AMERICAN EDUCATION. By Ray Palmer Baker. Size, 5 by 7½ inches. Pages, 170. New York, 1914: Charles Scribner's Sons.

This book was prepared as a memorial of the hundredth anniversary of the foundation of Rensselaer Polytechnic Institute. For half a century this institute was one of the intellectual centers of America and held a vital place in the development of agriculture, and in the liberal arts, science and technology. Credit for the origin of the system of education fostered at Rensselaer belongs to Amos Eaton and to Stephen Van Rensselaer who made the institution possible. The part played by these men is given in the first chapter of the book, "Origin and Aims." Following chapters discuss the curricula and traditions, natural science, the learned professions, public services, canals and railroads, structures and mechanisms, business and industry and engineering.

MERCHANT SHIP TYPES. By A. C. Hardy. Size, 5½ by 8½ inches. Pages, 316. Figures, 173. New York, 1924: D. Van Nostrand Company.

One of the most interesting books which has recently come to our notice—a book which will make a particularly strong appeal to everyone connected with ships, no matter how remote the connection may be—is "Merchant Ship Types."

The author, in his preface says: "An endeavor has been made to link up the various forms of water transport, and from that point of view, to discuss ship types, not as separate and apparently unconnected units of water transport, but rather as essential parts of a homogeneous whole."

The shipbuilder would never have reason to be dissatisfied with his work did it always so nearly "meet specifications" as Mr. Hardy's book fulfils the requirement which he has thus laid down.

While the work is mainly descriptive and many of the illustrations have been published elsewhere, the grouping and treatment is such that much which otherwise might appear to be "old stuff" is presented in a new light and acquires added interest when viewed from a different angle from that to which one has become accustomed in his daily, routine work.

The press work and illustrations are excellent.

We have no hesitation in recommending this book to the attention of all who "are interested in the sea and ships."

PERSONAL MENTION

M. E. FARR, president of the American Ship Building Company, Cleveland, O., tendered his resignation at a meeting of the Board of Directors of the company held in Jersey City, October 9. His successor has not as yet been selected by the Board. Mr. Farr was born in Clayton, N. Y., October 5, 1863, and after graduating from the high school at this place served on the lakes for one season. He then entered the employ of the banking firm of Elias Farr & Company, Marquette, Neb., and when only 21 became cashier of the bank. A year later he was placed in charge of the business. In 1892 he went to Detroit as bookkeeper and cashier of the Detroit Dry Dock Company In the year 1899 he was appointed secretary and treasurer and in 1905 succeeded W. C. McMillan as vice-president. In 1907, upon the resignation of Mr. McMillan, he became president. At the time of his appointment as vice-president of the American Ship Building Company, the parent organization, in September, 1914, he retained his office as president and treasurer of the Detroit company which had become the Detroit Shipbuilding Company. In 1915 he became president of the American Ship Building Company and has capably directed its affairs up to the present time.

M. E. Farr

HENRY E. FRICK, until recently acting superintending engineer in London of the United States Shipping Board, has been appointed operating manager of the Export Steamship Corporation, New York.

CAPTAIN WARRENT F. PURDY, formerly manager of the operating department of the United States Fleet Corporation's organization in London, has arrived in Washington after seven years' service in Europe and will become district director of the New England division, with headquarters in Boston.

SIR CHARLES A. PARSONS, famous English engineer and scientist who developed the reaction type of steam turbine, visited the General Electric plant at Schenectady for the first time on September 24. He was accompanied by Lady Parsons. While in Schenectady they were guests of Dr. E. W. Rice, Jr., honorary chairman of the General Electric board.

Generated on 2024-09-12 12:15 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

CHARLES C. JAMES has been appointed vice-president of the Alderton Dock Yards, Ltd., Brooklyn.

MARTIN G. KINDLUND, of the firm of Kindlund and Drake, naval architects and engineers, of 17 Battery Place, New York, has recently severed his connection with the Department of Plant and Structures of the City of New York. He was appointed naval architect of the department by Commissioner Grover A. Whalen in June, 1920, and has served in that capacity for over four years. During that period Mr. Kindlund has been identified with the design and construction of a number of ferryboats of different sizes and types, as well as carrying on other work in connection with the marine activities of the department. Mr. Whalen resigned as commissioner last July and Mr. Kindlund continued to serve as naval architect only until the expiration of his term of appointment on September 1. The new commissioner, William Wirth Mills, has made other arrangements for the supervision of the building of the six new East River ferryboats, which were designed in the Department of Plant and Structures under Mr. Kindlund's direction.

M. G. Kindlund

VICTOR M. CUTTER, formerly third vice-president of the United Fruit Company, has been elected president to succeed the late A. W. Preston. He was born at Dracut, Mass., September 2, 1881, and received his early education in the public schools at Lowell, Mass. In 1903 he graduated from Dartmouth College and from the Graduate Tuck School of Administration and Finance in 1904. On June 1, 1904, he entered the service of the United Fruit Company as timekeeper on a plantation in Costa Rica; the next year he became overseer of the plantation and was placed in charge of the agricultural experiment station. In 1906 he was made superintendent of the Zent District, Costa Rica, and head of the agency and shipping work at Port Limon. During the next few years he carried on inspection and exploration work in Nicaragua, serving as manager of the Guatemala Division, developing new plantations, and becoming manager of the Tela and Truxillo Railroads in Honduras. In 1915 he became general manager of the Central and South American department; the following year, general manager of the tropical banana divisions and in 1917 was appointed vice-president in charge of the tropical divisions with headquarters in Boston. From 1917 to 1924 he was in charge of the tropical development program in both sugar and banana plantations and was personally associated with Mr. Preston during that time.

V. M. Cutter

ALFRED H. BROMELL has resigned as vice-president and director of the Munson Steamship Line.

GENERAL JAY J. MORROW, Governor of the Panama Canal, has tendered to the President, through the Secretary of War, his resignation as Governor and it was accepted and became effective October 15. Following Governor Morrow's recommendation, seconded by Secretary Weeks, the President has appointed Colonel M. L. Walker, Corps of Engineers, U. S. Army, to succeed Governor Morrow. General Morrow has been connected with the Canal from June, 1915, to the present time, except for a period of less than two years during the World War, when he was in active service with the Army in France as Chief Engineer, First Army, and Deputy Chief Engineer, A. E. F. He served with the Canal as Engineer of Maintenance (from 1915 to 1917 and from 1919 to 1921) and succeeded General Chester Harding as Governor at the expiration of the latter's term, in March, 1921, General Harding having been the successor of General Goethals, the Canal builder and first governor. General Harding's appointment to succeed General Goethals established the precedent of the appointment of the engineer of maintenance to succeed the governor. The precedent was followed in Governor Morrow's appointment, and Colonel Walker's selection follows the same precedent, insuring a continuance of the policies which have been carried out so successfully under his three distinguished predecessors.

Gen. Jay J. Morrow

COLONEL MERIWEATHER L. WALKER, Corps of Engineers, the new Governor of the Panama Canal Zone, was born in Virginia on September 30, 1869, and has had a long and distinguished military and engineering career. Colonel Walker graduated from West Point in the class of 1889, was immediately commissioned in the Corps of Engineers, and has served through all grades up to and including that of Colonel. Prior to the World War he served, among other duties, as district engineer, in several engineering districts. He was professor of practical military engineering at West Point, and was later commended by General Pershing for his service as chief engineer in the punitive expedition into Mexico (1916-17). During the World War Colonel Walker was Division engineer of the 41st Division, assistant chief engineer of the American Expeditionary Forces, and director of the motor transport corps. During his service in the latter capacity he held the temporary rank of brigadier general. He has been awarded the distinguished service medal. At the conclusion of the World War, Colonel Walker was assigned to duty at the Army War College, and after graduating from that institution in 1920, became commandant of the engineer school. Since July, 1921, he has been engineer of maintenance of the Panama Canal.

Col. M. L. Walker

Generated on 2024-09-12 12:04 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

The Month's Shipping and Shipbuilding News in Brief

Shipyard, Steamship and Port Activities and Other Notes of Interest in All Branches of the Marine Industries

Ship Work Placed in Nine Months Reaches Close to 50 Millions

THE "dull season"—usually considered as the summer months—was productive of over $13,000,000 worth of vessel construction and repair business placed this year, according to the records compiled by MARINE ENGINEERING AND SHIPPING AGE. The figures for the three months' period from July 1 to October 1 for this class of work are $13,168,313 as compared with $24,082,782 for the second quarter of the year, and $11,426,144 for the first quarter, making a total to date of $48,677,249. The figures $13,168,313 for the past three months compare with $5,217,130 for the same period of 1923. For the third quarter of the past year, MARINE ENGINEERING AND SHIPPING AGE reported vessel construction and repair work under contemplation in the amount of $22,400,000.

Port work reported in these pages as awarded during the third quarter of the year amounted to $4,766,904 and as contemplated $30,420,500. These figures compare with $8,054,994 and $21,047,246 awarded in the second and first quarters, respectively, and $21,191,365 and $57,526,300 announced as under contemplation for the same respective periods.

Lakes Company Plans to Build Steam Tugs During Next Year

THE Great Lakes Towing Company of Cleveland, Ohio, is considering building for 1925 delivery, two steam driven harbor tugs. The vessels will be of steel, having a length of 71 feet, beam, 20 feet and depth, 12 feet 6 inches.

The tugs are to be equipped with powerful engines and will be suitable for handling boats up to 600 feet in length, carrying up to 13,000 tons of coal or ore in the harbors of the Great Lakes.

Specifications Pending For Converting Steamer Clio for Expedition

PLANS and specifications are now being prepared by Edwin C. Bennett, naval architect and consulting engineer, 15 Broad Street, New York, and will shortly be issued to shipbuilders for quotations for converting the twin screw wood steamer *Clio* for use in a deep sea scientific expedition to the Galapagos Islands and the Sargasso Sea, under the direction of Professor William Beebe, on behalf of the New York Zoological Society. It is expected the vessel, which will be re-named *Arcturius*, will leave New York early in 1925 and be away about six months.

Los Angeles to Take Proposals on New Fireboats

The city of Los Angeles is reported as considering the addition of two new fireboats to the harbor fire-fighting facilities. Specifications have been prepared for a 91-foot fireboat, 18 feet beam and 7 feet draft, with pumping equipment, having a capacity of 7,500 gallons per minute and a telescopic water-tower 40 feet high, to cost $200,000.

Nearly Two Millions to Be Spent by New York City for Construction of Additional Steam Ferryboats

FOR the construction of new ferryboats, the Department of Plant and Structures of the city of New York contemplates the carrying out of a program involving approximately two million dollars, the expenditure of several hundred thousand dollars of this fund to begin in the near future. The Department has before the Board of Estimate a request for funds for the building of six ferryboats, four to be used in the Rockaway Island service and two in the College Point service and the request of Commissioner Mills for the sum of $540,000, $300,000 of which is to be used for the construction of 93-foot ferries of the *Bird S. Coler* type for institutional service. It is expected that plans and specifications for these latter boats will be issued in about a month.

It is planned not to issue new specifications for the College Point and Rockaway boats. The commissioner announced that these vessels will be duplicates of the six now under construction for East River routes. The East River boats are of the double-ended type, having three driveways for vehicles and two cabins for passengers on the main deck. They have a length over guards of 151 feet; length outside end posts, 148 feet; breadth over guards, 53 feet; breadth of hull, molded, 37 feet 6 inches; depth from base line to top of beams at center of boats amidships, 15 feet. Propulsion is by two vertical, direct-acting, fore and aft compound engines, coupled together with cylinders 12 inches by 26 inches and 18-inch stroke, steam being supplied by two watertube boilers, having a heating surface of not less than 1,550 square feet, the boilers being built for a working pressure of 225 pounds per square inch and fitted for burning oil fuel. Complete details of this type of boat were announced on page 378 of our June, 1924, issue.

Reconstruction of Dredges Is Planned by U. S. Engineer Office, Louisville

The United States Engineer Office, Box 72, Louisville, Ky., is accumulating construction plant to complete the Ohio River Lock and Dam project. Next year will be the peak construction year with eight locks and dams under construction and the plant which is always in hand for the next season, will be finished during the winter.

Work to be done in connection with the floating equipment includes the reconstruction of two dredges and the delivery of derrick boat hulls, now under construction, on receipt of which the derrick boats will be assembled and put into service.

The Staten Island Shipbuilding Company has been awarded the contract for general repairs to the government dredge *Navesink*.

Generated on 2024-09-12 12:12 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Generated on 2024-09-12 12:05 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google

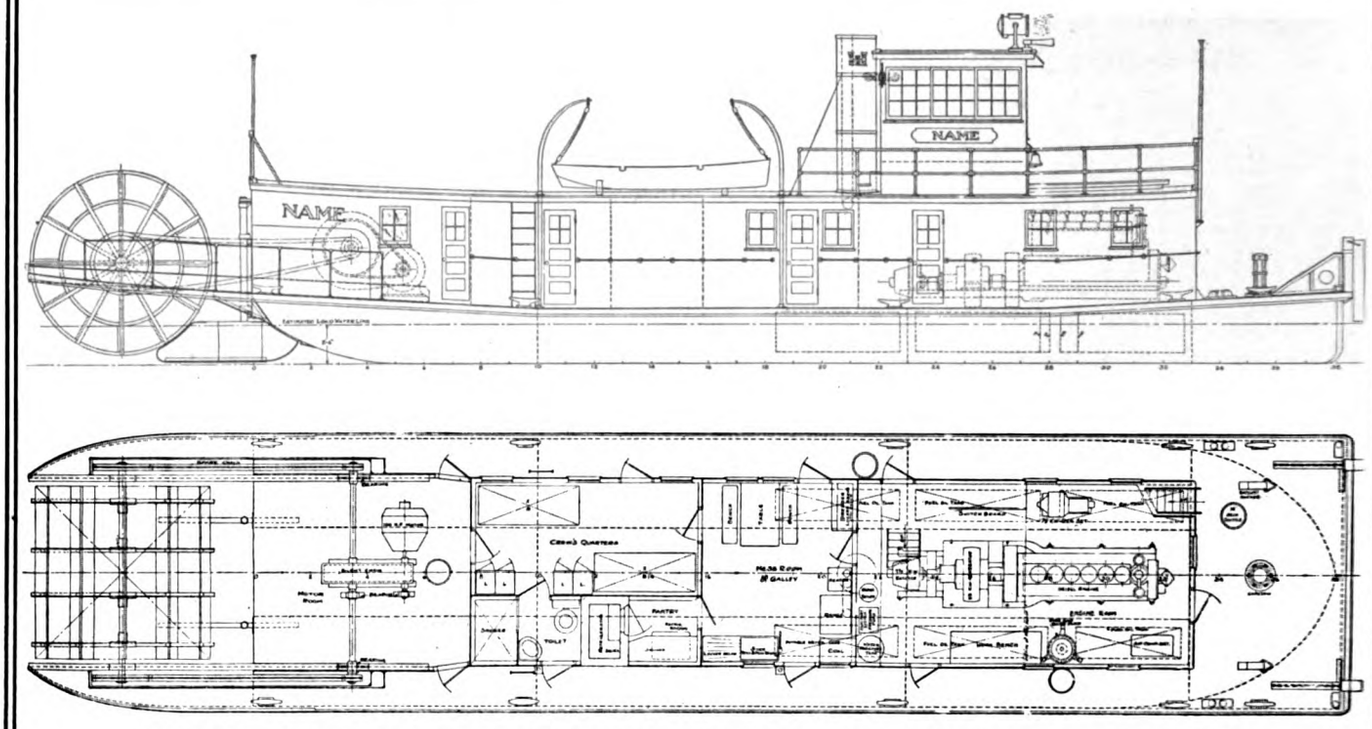
Summary of Bids Opened October 14, 1924, by U. S. Shipping Board for Furnishing Diesel Engines.

Bidder	Price				Shop Tests	Delivery				Type	No. of Cylinders	Horse-power	R.P.M.
	1 Engine	2 Engines	3 Engines	4 Engines		1 Engine	2 Engines	3 Engines	4 Engines				
Bethlehem S. B. Corp.:													
Proposal No. 1	$278,500	$529,000	$735,000	$968,000	If all shop tests required, will increase bids: 1 eng., $90,000; 2 engs., $97,000; 3 engs., $102,000; 4 engs., $105,000.	10 mos.	12 mos.	14 mos.	16 mos.	Bethl. 2-cycle, single-acting, vertical, with attached scavenging pumps.	6—26"x48"	2,225	95
Proposal No. 2	279,600	531,200	738,300	972,400		10 mos.	12 mos.	14 mos.	16 mos.	Bethl. 2-cycle, single-acting, vertical, with independent scavenging blowers.	6—26"x48"	2,400	95
Proposal No. 3	338,500	645,000	892,800	1,181,400		12 mos.	14 mos.	16 mos.	18 mos.	Bethl. 2-cycle, single-acting, vertical, with attached scavenging pumps.	6—27"x60"	2,700	85
Busch-Sulzer Bros.	339,700	605,000	856,000	275,000 ea. in excess of three	Will reimburse $16,000 if shop tests omitted.	14 mos.	16 mos.	18 mos.	And one every 2 mos.	Busch-Sulzer, 2-cycle, vertical, single-acting.	6—30"x52"	3,000	90
Wm. Cramp & Sons S. & E. Bldg. Co.	320,000	614,000	896,000	1,171,000	Not included.	10 mos.	And one every six weeks.			4-cycle, single-acting, Burmeister & Wain.	8—29⅛"x59"	2,500	90
Falk Co. Proposal No. 1	169,000	322,000	477,000	628,000	Will reimburse $900 if shop tests omitted.	240 days.	And one every 45 days.			4-cycle, single-acting, geared marine engine.	12—20"x28"	2,400	75
Proposal No. 2	232,000	.....	.....	.....		460 days.				4-cycle, single-acting, geared marine engine.	12—24"x28"	3,000	75
Hooven-Owens-Rentschler Co.	.....	534,500	.....	.....	Includes shop tests—will reimburse $5,000 for first engine if tests omitted.	15 mos	18 mos.	.....	.....	Hamilton M. A. N. double-acting, 2-cycle.	4—27.55"x43.30"	3,050	95
McIntosh & Seymour:													
Proposal No. 1	290,900	561,925	837,450	1,094,975	Will reimburse $11,250 for first engine if tests omitted.	10 mos.	And one every 45 days.			Vertical, 4-cyc., single-acting.	6—32"x60"	2,600	95
Proposal No. 2	266,086	512,422	763,558	995,494	Will reimburse $10,500 for first engine.	10 mos.	And one every 45 days.			Vertical, 4-cyc., single-acting.	6—32"x60"	2,350	95
Proposal No. 3	377,780	730,475	1,088,970	1,424,265	Will reimburse $13,950 for first engine.	10 mos.	And one every 45 days.			Vertical, 4-cyc., single-acting.	8—32"x60"	3,450	95
Proposal No. 4	259,600	498,980	742,960	968,540	Will reimburse $11,400 for first engine.	10 mos.	And one every 45 days.			Vertical, 4-cyc., single-acting.	4—32"x52"	2,700	95
New London S. & E. Co.:													
Proposal No. 1	210,000	410,000	606,000	808,000	Without shop tests.	15 mos.	17¾ mos.	20⅓ mos.	23 mos.	2-cycle, double-acting.	4—27.55"x43.30"	3,000	95
Proposal No. 2	222,000	424,000	627,000	828,000	With shop tests as specified by New London.	15⅓ mos.	18⅓ mos.	21⅓ mos.	24⅓ mos.	2-cycle, double-acting.	4—27.55"x43.30"	3,000	95
Proposal No. 3	230,000	432,000	634,500	836,000	With shop tests as specified by New London.	16 mos.	19 mos.	22 mos.	25 mos.	2-cycle, double-acting.	4—27.55"x43.30"	3,000	95
Proposal No. 4	275,000	479,000	682,500	890,000	With shop tests as specified by New London.	16½ mos.	19½ mos.	22½ mos.	25½ mos.	2-cycle, double-acting.	4—27.55"x43.30"	3,000	95
New York S. B. Corp.	205,000	410,000	.....	.....	$20,000 additional on first and $12,000 on second if tests required.	12 mos.	14 mos.	.....	.....	Werkspoor, vert., 4-cycle, single-acting.	8—29"x59"	2,432	90
Nordberg Mfg. Co.	350,000	580,000	810,000	1,057,000	Incl. shop tests; will reimburse $66,500 if tests omitted.	11 mos.	And every 2½ to 3 mos. thereafter.			Nordberg, vert., 2-cycle, single-acting.	6—29"x54"	3,000	90
Pacific Diesel Eng. Co.:													
Proposal No. 1	192,500	367,000	529,500	706,000	Will reimburse $7,000 if shop tests omitted.	240 days.	And every 40 days thereafter.			Werkspoor, vert., 4-cycle, single-acting.	8—28¾"x51⅛"	2,400 / 2,150	95
Proposal No. 2	206,500	393,000	561,000	748,000	Will reimburse $8,000 if shop tests omitted.	240 days.	And every 40 days thereafter.			Werkspoor, vert., 4-cycle, single-acting.	8—31½"x51⅛"	2,900 * / 2,585	95
Sun S. B. Co.:													
Proposal No. 1	195,000 each for four engines.				Plus $15,000 for each engine if shop tests required.	7 mos.	And one each month thereafter.			Sun-Doxford opposed piston, 2-cycle.	4—22.83"x91.34"	2,500	90
Proposal No. 2	225,000 each for four engines.				Plus $15,000 for each engine if shop tests required.	7 mos.	And one each month thereafter.			Sun-Doxford opposed piston, 2-cycle.	4—22.62"x91.34"	3,000	90
Worthington Pump & Machinery Corp.	243,224	440,214	625,661	799,928	Will reimburse $19,500 if shop tests omitted.	9 mos.	10 mos.	12 mos.	13 mos.	2-cycle, double-acting.	4—28"x40"	2,900	95

NOTE—The above figures do not take into account such miscellaneous extras as special equipment, spares, guarantee engineers, etc.

*With detached compressor.

Digitized by Google
Original from UNIVERSITY OF MICHIGAN



Outboard Profile and Deck Plan of Towboat, Two of Which Are Planned by Cincinnati Engineer Office.

Plans and Specifications Pending for Construction of Two Diesel-Electric Driven, Steel, Stern-Wheel Towboats

PLANS and specifications for the construction of two 70-foot Diesel-electric stern-wheel towboats, will be issued in the near future from the United States Engineer Office, 405 Custom House, Cincinnati, Ohio.

The main power plant of this boat will consist of a Diesel-electric generator unit of not less than 92½ kilowatt capacity. The main generator will be 85 kilowatts at 240 volts and the exciter 7½ kilowatts at 120 volts. The propulsion motor will be of 100 horsepower, rating on a 2-1 speed range, and will drive the stern-wheel through a double reduction chain drive.

Sperry Prizes Awarded

THE cash prize contest of the Sperry Gyroscope Company of Brooklyn, N. Y., which called for a title for a picture showing Metal Mike (Gyro-Pilot or automatic steering device) in control of the wheel with a phantom of the traditional quartermaster standing at the wheel, opened June 1 and closed August 31.

This contest, which was limited to seagoing personnel of the merchant service and navies of the world, and seagoing personnel temporarily on land duty such as port captains, marine superintendents, etc. (which included the personnel of the Great Lakes), created widespread interest. Contributions were received from all over the world and the following are the winning titles and the contestants as selected by the judges:

First prize, $100.00: "A Fading Phantom—An Accurate Reality." Master F. B. Parsons, S.S. *Harry Coulby*, Great Lakes Steamship Company, Cleveland, Ohio.

Second prize, $50.00: "With Sperry Steering, He's Disappearing." Captain William R. Leith, Barge *C*, Standard Oil Company (Indiana), Whiting, Ind.

Third prize, $25.00: "Real Iron Men Have Come Again." Chief Mate Walter G. Hodgins, S.S. *Norfolk*, Coastwise Transportation Corporation, Boston, Mass.

The next five prizes, of $5.00 each, were awarded as follows:

"The Human Equation Eliminated." Everett D. Saunders, Third Mate, S.S. *Selwyn Eddy*, Castner, Curran & Bullitt, Norfolk, Va.

"Metal Mike and Vanishing Jack." Master Robert E. Hudgins, S.S. *Bylayl*, Pocahontas Steamship Company, New York City.

"Quartermasters Present and Past." C. M. Christensen, Second Officer, S.S. *Martinique*, Columbian Line, New York City.

"Modern Mariner Versus Ancient Mariner," Gordon B. Rabbitts, Radio Operator, Standard Oil Company (New Jersey), New York City.

"Metal Supersedes Mettle." Lieut. Kenneth L. Coontz, U. S. S. *Corry*, United States Navy, New York City.

The judges in this contest were Mr. T. H. Rossbottom, general manager of the United States Lines, New York; Mr. J. L. Luckenbach, vice-president of the Luckenbach Steamship Company, New York, and Captain A. M. Chalmers, assistant marine superintendent of the Cunard Company, who acted for Captain D. S. Miller, marine superintendent of the Cunard Company, who was ill at the time.

All contestants received an elaborate brochure from The Sperry Gyroscope Company covering complete theory of the gyro-compass.

Contract for N. Y. C. Ferryboat Awarded to Staten Island Yard

A CONTRACT for the construction of a double deck screw propelled steel ferryboat has been awarded by the New York Central Railroad Company to the Staten Island Shipbuilding Company, as a result of bids received on September 19. The Staten Island Company's price was $448,800, including the W. & A. Fletcher Company engine, with an alternate proposal of $439,800. The Fletcher engine will be installed.

Extensive Repair Job Anticipated on Dollar Steamer President Polk

SURVEYS are in progress to determine the extent of fire damage sustained by the Dollar Line steamship *President Polk* at her pier in Brooklyn recently, and specifications for repairs will be in course of preparation in the near future. A definite estimate of the extent of the damage could not be obtained, although it is understood that the repair contract will involve a considerable sum of money.

Lord Drydock Plant Sold

The properties of the Lord Drydock Company in North Bergen and Guttenberg, N. J., valued at $7,000,000 during the war, were sold on Thursday, October 9, to Peabody, Houghteling and Company, Chicago, bankers, for $3,000,000. The purchasing company were sponsors for $3,500,000 in bonds issued on the property during the war.

Generated on 2024-09-12 12:06 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Steamship Robert E. Lee Launched at Newport News

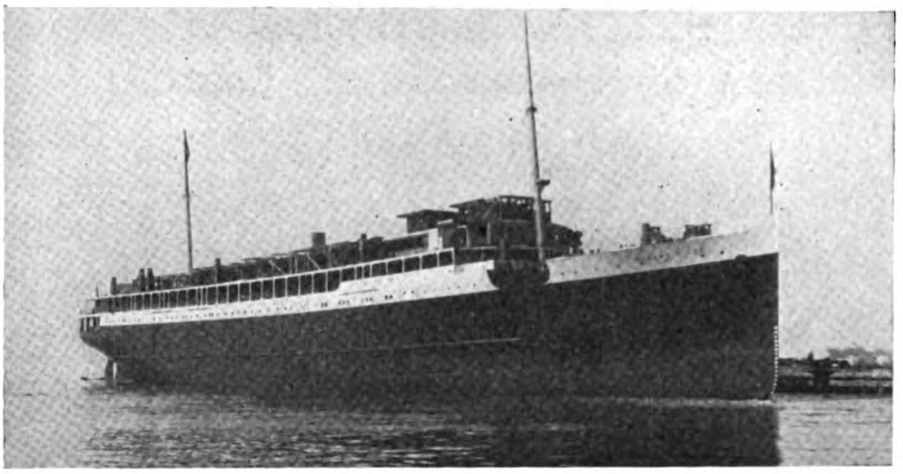
THE Old Dominion passenger and freight ship *Robert E. Lee,* sister ship of the *George Washington,* was launched at the Newport News Shipbuilding & Dry Dock Company, Newport News, Va., Thursday, October 16. The sponsor for the vessel was Miss Mary Custis Lee of Upperville, Va., granddaughter of General Robert E. Lee. The *Robert E. Lee,* which will be in the Old Dominion Line service between New York and Virginia ports, has the following principal dimensions:

Length, overall	389 ft.
Length, between perpendiculars	375 ft. 6 in.
Beam, molded	53 ft. 9 in.
Depth, molded to hurricane deck	29 ft. 9 in.
Depth, molded to main deck	20 ft. 6 in.
Designed load draft	17 ft. 9 in.
Displacement at load draft	6,425 tons
Speed	16 knots

The vessel will be a steel single screw steamship of the hurricane deck coastwise type with lower main, hurricane, promenade and boat decks and with a shade deck amidships. A complete double bottom will be fitted from the forepeak tank to the afterpeak tank.

PROPELLING MACHINERY

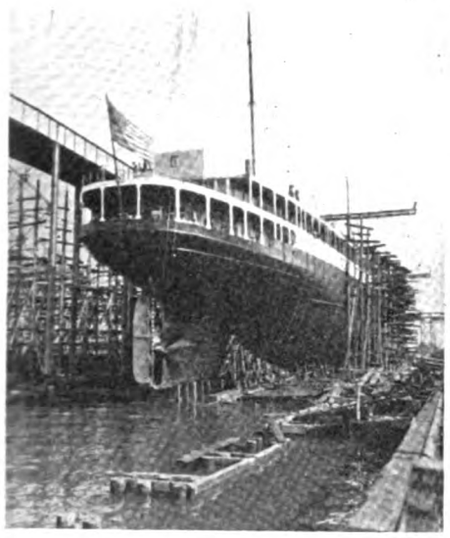
The propelling machinery will consist of high pressure and low pressure single reduction gear turbines driving a single screw; steam to be supplied by 4 Babcock & Wilcox watertube, oil burning boilers fitted with superheaters.



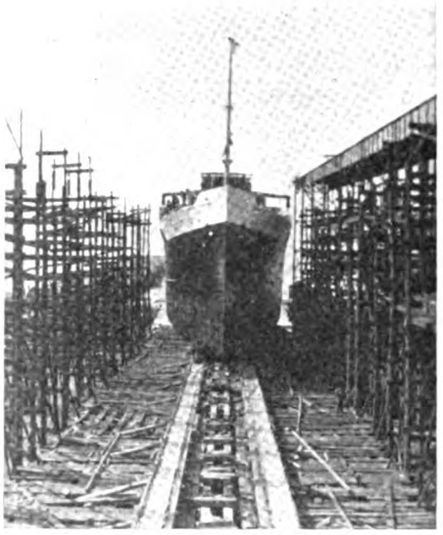
S. S. Robert E. Lee Just After Launching at Newport News on October 16

The ship has been built under the special survey of the American Bureau of Shipping and to conform with the requirements of the United States Steamboat Inspection Service. She will have accommodations for 250 first class passengers and for approximately 240 steerage passengers and immigrants.

The crew will number approximately 100. The *Robert E. Lee* and her sister ship will be luxuriously fitted for coastwise service.



Ready for Launching



Going Down the Ways

The Sponsor and Her Maids of Honor

New Diesel-Electric Tanker Ordered by Standard Oil of Cal.

FOLLOWING the satisfactory operation of two Diesel-electric tankers now in its service, the Standard Oil Company of California has ordered a third which, it has been reported, will operate between San Francisco and the Hawaiian Islands. This tanker will be similar in all respects to the two others with one exception: The engine room will be amidships and the propelling motor aft. In the previous craft, the engine room was aft.

The new tanker, as announced in our last issue, will have an overall length of 221 feet; length between perpendiculars, 210 feet; beam, molded, 36 feet; depth, molded, 16 feet 6 inches; approximate mean draft, loaded, 13 feet 6 inches. Power will be generated by two 245 kilowatt, Diesel engine-driven generators, normally to operate in series. A 30-kilowatt generator, using the same shaft, will be included in each set for excitation purposes and auxiliary power. Propelling power will be furnished by one 600-horsepower, 130 revolutions per minute motor, driven by the main generators. The auxiliary generators will operate alternately, one acting as a stand-by for the other.

In addition to the propelling equipment, electric power is used for auxiliaries above and below decks. All the electrical machinery is of General Electric manufacture. Below decks, electric power will drive ventilating and pumping apparatus and a 5-kilowatt generator will carry the auxiliary lighting load. The deck machinery will include anchor windlass, cargo winch and capstan motor equipments.

Newport News Yard Awarded Repair Contract on Steamer Pres. Roosevelt, Bids to Be Asked on Three Others

A CONTRACT for a general overhauling of the hull and machinery of the United States Line steamship *President Roosevelt* has been awarded the Newport News Shipbuilding and Drydock Company, at a price of $45,416, as a result of bids received at Hoboken, N. J., on Wednesday, October 8. The work is to be completed by November 8 and the ship will sail for Bremen on November 14. It is expected that the specifications for a similar contract on the steamships *America, President Harding* and *George Washington* will be issued between the present time and February, 1925.

The bids submitted for the work on the *President Roosevelt* were as follows:

Newport News	$45,416
Bethlehem	52,555
Robins	57,340
Morse	67,653

Generated on 2024-09-12 12:27 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

W. & A. Fletcher Company Lowest Bidder for Reconditioning Contract on Panama Line Steamer Ancon

THE W. & A. Fletcher Company, Hoboken, N. J., with a price of $482,400 and 116 days' time, submitted the lowest proposal for the repairs, removals, alterations and additions to be made to the steamship *Ancon* of the Panama Steamship Company, at the opening of tenders on Thursday, October 9.

The work provides, among other things, for the rearrangement of the present spaces on the shelter bridge and boat decks to accommodate approximately 250 passengers and additional crew; installation of a new steel deckhouse; extension of the bridge deck; new boat deck; the installation of refrigerator space and equipment, and a general overhauling of the main engines, boilers, auxiliaries and electrical system. Bids submitted for the contract were as follows:

Fletcher	$482,400	116 days
Morse	507,000	150 days
Sun	545,000	125 days
William Cramp & Sons	550,000	180 days
Federal	553,703	175 days
Staten Island	563,900	150 days
Newport News	582,759	150 days
Robins	589,000	150 days
Bethlehem	599,540	138 days
Tietjen & Lang	619,064	150 days
New York Ship	695,000	225 days

Repairs to U. S. Dredge Atlantic Awarded to Staten Island Yard

THE Staten Island Shipbuilding Company has been awarded a contract for general overhauling of the United States dredge *Atlantic,* as a result of tenders received on Wednesday, October 8. The Staten Island yard submitted a price of $47,837 and 25 days' time. Bids submitted were as follows:

Federal	$47,000	28 days
Staten Island	47,837	25 "
Robins	49,000	35 "
Tietjen & Lang	49,223	26 "
Clinton Drydocks	51,200	34 "
Morse	58,200	25 "

Tiebout Equips Seventy Coast Guard Picket Boats

THE firm of W. & J. Tiebout, 118 Chambers Street, New York, has secured the order to furnish all the equipment, except engines, for the entire fleet of seventy 36-foot cabin picket boats now being constructed for the U. S. Coast Guard Service. It is believed that this is the first time that one firm has received a contract of this type

The outstanding feature of this order is that the Coast Guard secures complete standardization of parts and equipment for this fleet, a factor that will greatly increase its efficiency and effect material economies in replacements and repairs. Its vessels will not be required to carry cumbersome stocks of special equipment. In case of emergency, quick interchange of parts can be effected. By standardizing in this manner, depot supplies of spare parts can be greatly reduced.

Bethlehem Awarded Reconditioning Job on S. S. Edward Pierce

THE Bethlehem Shipbuilding Corporation, Ltd., of Boston, Mass., has been awarded a contract for repairs to the steamship *Edward Pierce,* which was recently sunk in Boston Harbor, at a price of $51,975 and 31 days' time. The bids submitted were as follows:

Bethlehem Shipbuilding Corporation	$51,975	31 days
Sun Shipbuilding Company	51,684	42 days
Morse Shipbuilding	53,500	29 days
Robins Drydock	56,800	30 days
Tietjen & Lang	59,725	25 days
Atlantic Works	64,452	28 days
Newport News Shipbuilding & Drydock	64,700	38 days
New York Harbor	74,104	55 days

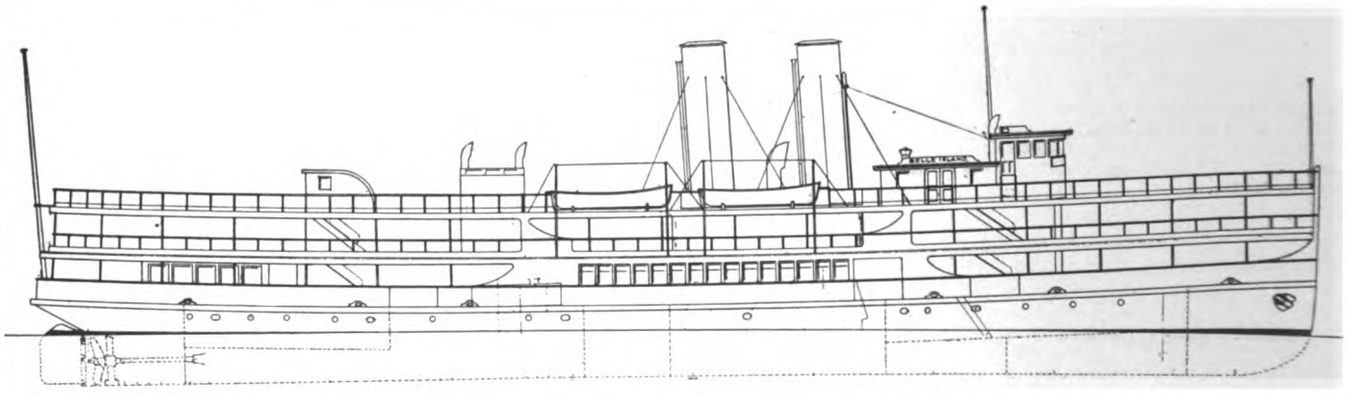
Institute of Research Established at Lehigh University

AN announcement was recently made of the launching of the Lehigh Institute of Research by the administration of Lehigh University, Bethlehem, Pa. The management of the new organization, which was authorized by the board of trustees on April 25, 1924, is vested in a board of directors composed of thirteen members of the University's staff, including President Charles Russ Richards. Each man is a recognized authority in his special field.

In announcing the purposes of the Institute, the Lehigh Board of Trustees, of which E. G. Grace, president of the Bethlehem Steel Corporation, is president, stated that the object is "to encourage and promote scientific research and scholarly achievement in every division of learning represented in the organization of the University; and in recognition of the need for further and more exact knowledge in science and in the applications of science to the affairs of modern life. It is believed that this organization will be helpful in stimulating interest in liberal and professional education; and that it will prove to be of value to the professions and industries of the nation."

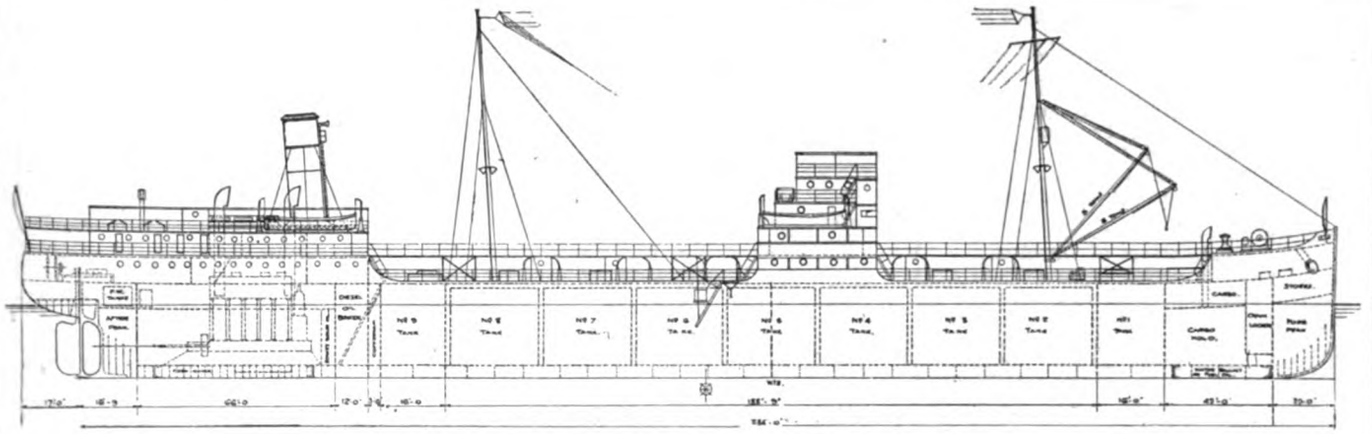
The Lehigh Institute of Research will afford training in research methods to the following classes of individuals: the members of the teaching staff of the University; the members of the scientific staff of the Institute, including research fellows, research assistants and research professors appointed by the University and paid by it from its own funds or from funds for the purpose supplied by an individual, a firm or a corporation; graduate students in the University; special investigators temporarily employed for work on a particular investigation.

To preserve the records of its investigations and to render them available to everyone interested, the Lehigh Institute of Research proposes to publish and distribute from time to time bulletins presenting the results of investigations conducted by or under the direction of the Institute; and to issue other material which may be helpful to the various interests which the Institute seeks to serve. Under certain conditions and with the approval of the Executive Board, reports of such investigations may be presented before professional or other learned societies and published by them.



Outboard Profile of Passenger Steamer Designed by Townsend J. Smith, Naval Architect, to Be Built at Newburgh, N. Y., for New York-Roton Point Service. Details Were Announced in the October Issue, Page 626.

Generated on 2024-09-12 12:04 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN



Outboard Profile of Motor Tanker to be Built in France

Charleston Shipyard Low Bidder for Steel Steam Driven Snagboat

TENDERS were received and opened by the United States Engineer Office, Montgomery, Ala., October 15, for the construction and delivery of one 156-foot steel hull steam driven stern-wheel snagboat. The vessel is to have a length, molded, of 156 feet; length overall, 178 feet; breadth, molded, 33 feet; breadth overall, 34 feet 1½ inches; depth at side, molded, 5 feet 6 inches. The bids submitted were as follows:

Charleston Drydock & Machine Company	$189,900
Dravo Contracting Company	194,600
(alternate)	186,600
Charles Ward Engineering Works	237,790
Howard Shipyards & Dock Company	273,743

Buffalo Engineer Office to Ask Bids on Seven Barge Contract

Plans and specifications are in course of completion by the United States Engineer Office, P. O. Box 960, Buffalo, New York, for the construction of seven steel deck barges, and it is expected that bids will be requested in the near future. The sum of $176,000 has been allotted for the building of these boats.

S. O. Lighter Launched

The Diesel motor lighter *Charlie White* was launched on September 29 by the Kingston Drydock & Shipbuilding Company, Kingston, New York, for the Standard Oil Company of New Jersey. The vessel has an overall length of 106 feet 9 inches; breadth, molded, 28 feet; draft 10 feet 3 inches, and is propelled by a Winton-Diesel engine of 225 brake horsepower. The vessel will be used in New York harbor and vicinity.

Allotment for New Towboat

An allotment of $145,000 was recently made at Washington by army engineers, from current river and harbor improvement funds, for the construction of a towboat for operation in the Chattahoochee River in Georgia and Alabama.

French Shipyard Awarded Contract for Construction of 400-Foot, Diesel Driven New Design Trans-Atlantic Oil Tanker

A CONTRACT for the construction of a Diesel tanker for foreign account has been placed with the Chantiers et Ateliers de la Gironde, Bordeaux, France, delivery to be made on or about September 23, 1925. The vessel will have an overall length of 401 feet; molded breadth, 55 feet 6 inches; molded depth, 28 feet 6 inches, and is designed to carry 6,450 deadweight tons, at a maximum draft of 21 feet. The displacement on this draft is 9,825 tons of 2,240 pounds and the designed speed is 11 knots.

Propulsion will be by a two-cycle four-cylinder motor, developing 1,850 shaft horsepower at 90 revolutions per minute and is being built by Sulzer Brothers at Winterthur, Switzerland.

Special Design

The vessel is of special Isherwood design, cargo being carried in 18 cylindrical tanks, each with a capacity of about 300 tons. The contents of these tanks will be discharged by five electrically driven rotary type cargo pumps, located on the tank tops in the center line of the vessel between the tanks and connected up in such a manner that they can be utilized for pumping any one or any group of tanks simultaneously, there being a separate discharge pipe for each nest of tanks. A donkey boiler will be installed for the purpose of heating cargo oil only, as all auxiliaries, including deck machinery, steering gear and galley equipment will be electrically operated.

The vessel is believed to be of original design, the main reason for its peculiar structure being the absolute impossibility of contaminating various grades of refined lubricating oils when carried in separate tanks isolated from one another.

Accommodations

The accommodations for officers and crew have been very carefully thought out, all the deck officers being located in the bridge house, the engineer officers and unlicensed crew as well as the mess rooms located aft. The accommodations are so arranged that there are not more than two of the unlicensed men in any one room.

The vessel will probably be used in the trans-Atlantic service between New York, the Gulf ports and France.

Goodrich and Graham Steamship Lines on the Great Lakes Consolidate

THE merger of the Goodrich Transit Company and the Graham and Morton Transportation Company on the Great Lakes, with a capitalization of $5,000,000, gives the merger company 12 steamers between Lake Michigan ports. The new concern is known as the Goodrich Transit Company and will have headquarters in Chicago. Under the joint ownership the consolidated companies will have the following official management:

William Alden Smith, Grand Rapids, formerly chairman of the board of the Graham and Morton Transportation Company, becomes chairman of the new board; H. W. Thorp, president and general manager of the Goodrich Transit Company, of Chicago, retaining the same position in the merger; Captain E. Gunnell, of Manitowoc, Wis., vice president; J. Stanley Morton, Boston Harbor, Mich., formerly president and general manager of the Graham-Morton concern, vice president; W. J. Thorp, secretary-treasurer; and Perry K. Heath, of Grand Rapids, assistant secretary-treasurer.

Charleston Yard Is Awarded Contract for Government Towboat

THE Charleston Drydock & Machine Company of Charleston, S. C., has been awarded the contract for the construction of a steel, stern-wheel towboat for the United States Engineer Office at Montgomery, Ala. Proposals for the construction of the boat were received on August 15, the Charleston company being the low bidder, with a price of $130,765.

The towboat will have an overall length of 153 feet 4½ inches; beam, molded, 30 feet, and will be propelled by engines of high pressure, simple type, steam being supplied by a water-tube boiler. The vessel is to be completed and delivered at Apalachicola in 365 days.

Generated on 2024-09-12 12:10 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TRADE PUBLICATIONS

GROUP INSURANCE.—An explanation of the facts about group insurance is given in a catalogue sent out by the Travelers Insurance Company, Hartford, Conn. This book should prove of interest to those having a number of employees on the pay-roll.

DIESEL YACHTS.—A discussion of the advantages and disadvantages of Diesel engine power for pleasure yachts is outlined in a bulletin sent out by Cox & Stevens, naval architects and engineers, 25 Broadway, New York. Illustrations are given of a number of attractive ocean-going yachts equipped with Diesel engines with general details of these boats.

SPEEDIER PRODUCTION; BETTER BRASS.—The Detroit Electric Furnace Company has just issued a catalogue describing in detail the advantages, performance and results obtained with electric brass furnaces manufactured by this company. The outstanding features of economy, mechanical control and speed of production claimed for the furnaces are clearly outlined.

THE ATLANTIC WORKS.—A catalogue has just been prepared describing the largest and most completely equipped ship repair plant in the port of Boston—the Atlantic Works, located in East Boston. The general location and facilities of the plant with a short outline of the various departments are contained in the catalogue together with a series of attractive illustrations.

ENAMELED RESISTOR UNITS.—Bulletin No. 48941A, entitled "CR-9006 Enameled Resistor Units," has been issued by the General Electric Company. This is a well illustrated booklet describing the uses and advantages of these units and giving standard ratings and dimensions. Applications are given for several different fields of service. The bulletin contains 18 reading pages.

GASKETS.—A new catalogue, No. 17, covering McKim gaskets, has just been issued by the McCord Radiator & Manufacturing Company, Detroit, makers of these gaskets for 25 years. This catalogue covers gaskets of various metals; copper for general use, steam, water, air and internal combustion engines; aluminum for acid; steels for boiler handholds; tin, zinc and monel for special chemical conditions.

WORTHINGTON DIESEL ENGINES.—Bulletin No. S-171, published by the Worthington Pump & Machinery Corporation, New York, contains a technical description of the Worthington double acting two cycle oil engine. Another bulletin is also being sent out giving details of the engine as they appeared in articles published in MARINE ENGINEERING AND SHIPPING AGE, September, 1924, and in other technical publications.

ELECTRODE BOOKLET.—A 12-page booklet bearing the designation Y-2019 describes the new Type A General Electric welding electrode. Details are given on electrode construction and characteristics. Results of tests on welded cast iron specimens and deposited metal specimens are described, and oscillograms demonstrating arc stability are reproduced. Instructions for use of the electrode are supplied and specifications of the standard sizes given.

STREET LIGHTING TRANSFORMERS.—The General Electric Company of Schenectady has issued a new bulletin, No. 45124, "Street Lighting Transformers," of 32 pages and profusely illustrated. In it are described various types of General Electric constant current transformers, both indoor and outdoor and for pole or subway mounting, individual lamp series transformers, cutouts, transformer controls, and protective devices. A table of transformer capacities is also included.

Marine Societies

America

American Marine Association. 15 Park Row, New York. President—Frank J. Shipman.

American Society of Marine Designers. Secretary—B. G. Barnes, 202 Kendrick Ave., Quincy, Mass.

American Society of Naval Engineers. Navy Department, Washington, D. C. Secretary-Treasurer—Commander Bryson Bruce, U. S. N., Bureau of Engineering, Navy Department, Washington, D. C.

American Steamship Owners' Association. 11 Broadway, New York. President—Alfred Gilbert Smith. Vice-President and General Manager—Winthrop L. Marvin.

Atlantic Coast Shipbuilders' Association. 1600 Walnut Street, Philadelphia, Pa. Secretary—C. S. King.

Council of American Shipbuilders, Inc. 30 Church St., New York. President—Homer L. Ferguson. Secretary-Treasurer—Henry C. Hunter.

Lake Carriers' Association. President—Wm. Livingstone, Dime Bank Building, Detroit, Mich. Secretary—George A. Marr, Rockefeller Building, Cleveland, O.

National Association of Engine and Boat Manufacturers. 29 West 39th Street, New York City. Secretary—R. R. A. Hand.

National Association of Masters, Mates and Pilots. National Secretary—M. D. Tenniswood, 308 Vine St., Camden, N. J.

National Marine Engineers' Beneficial Association. Headquarters, 311-315 Machinists Building. Washington, D. C. Secretary-Treasurer—George A. Grubb.

National Merchant Marine Association. Munsey Bldg., Washington, D. C. President—Hon. J. E. Ransdell.

Neptune Association. 21 Pearl St., New York City. Secretary-Treasurer—Captain John F. Milliken.

Ocean Association of Marine Engineers. 15 Whitehall St., New York. Secretary—Bert L. Todd.

Port of New York Authority. 11 Broadway, New York. Chairman—E. H. Outerbridge. Secretary—William Leary.

Society of Naval Architects and Marine Engineers. 29 West 39th Street, New York. Secretary and Treasurer—Daniel H. Cox.

The Maritime Association of the Port of New York. 78 Broad St., New York City. President—Charles H. Potter. Secretary—Walter F. Firth.

The New York Tow Boat Exchange. 11 Moore St., New York. Secretary—Irving G. Keller.

United States Naval Institute. Naval Academy, Annapolis, Md. Secretary and Treasurer—Commander H. K. Hewitt, U. S. N.

United States Ship Operators' Association. 149 Broadway, New York. President—C. H. Potter.

Canada

Grand Council N. A. of M. E. of Canada. Grand Secretary-Treasurer—Neil J. Morrison, Box 886, St. John, N. B.

Great Britain

Institute of Marine Engineers, Incorporated. 85/88 The Minories, London, E.1.

Institution of Engineers and Shipbuilders in Scotland. 39 Elmbank Crescent, Glasgow.

Institution of Naval Architects. Adelphi Terrace, London, W. C.

Northeast Coast Institution of Engineers and Shipbuilders. Bolbec Hall, Westgate Road, Newcastle-on-Tyne.

Italy

Collegio Degli Ingegneri Naval e Meccanici in Italia.

BUSINESS NOTES

The J. B. King Transportation Company, of Manhattan, has changed its name to the United States Gypsum Transportation Company.

The Ever Ready Boiler Repair Company of 758 3rd Avenue, Brooklyn, has recently been organized to do machinist, blacksmith, steamfitting, electric and acetylene welding and similar marine work. The company was formed by William F. Carr, who has spent many years with shipyards in the port of New York and Harry A. Carr, who also served in New York shipyards and with the Horrick Conveyor Company.

The management of the Bethlehem Shipbuilding Corporation, which has been located at the Sparrow's Point plant, has been removed to the offices in the Stewart Building Baltimore. J. Macy Willis, general manager of the three plants has brought with him to the new offices H. A. Davidson, Jr., management representative and Maurice B. Caplan, secretary. G. A. Worn, sales manager at the city office, has been transferred to the Bethlehem office in New York, where he took up his duties on October 1.

The Clyde Line will increase its service between Boston, Charleston and Jacksonville to two sailings weekly.

The Enterprise Engine Company of San Francisco and the Western Machinery Company of Los Angeles have been consolidated. This brings together two of the largest and foremost builders of internal combustion engines on the Pacific Coast. There is to be no change in policy or personnel, although the headquarters of the combined companies will be in Los Angeles. W. J. Donlon will be in charge of operations and all Diesel engine business will be directed from the present Enterprise plant at Eighteenth and Alabama streets, San Francisco, with J. F. Browner, sales engineer of the Western Machinery Company, conducting the Western machinery business.

Vancouver Yard to Build New Shops

The Wallace Shipbuilding & Drydock Company, Limited, has taken out a $950,000 permit for the construction of machine shops and offices in connection with the drydock at Vancouver, B. C., the construction of which is approaching completion. Work on the machine shops and offices will be started at once. The total cost of the drydock and workshops will approximate three million dollars.

Generated on 2024-09-12 12:03 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN